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LOOKING FORWARD

PROPHECY is always dangerous, but there now seems to be a more optimistic spirit in the air concerning the future of most industries. The past year has, in general, been a difficult one. Steel, coal, textiles and many other trades have suffered from reduced activity—some drastically so.

But in spite of difficult trading conditions, some firms and industries have still maintained and even increased their volume of business. An outstanding industry in this respect is the motor car industry, which has shown remarkable progress since the setback of 1956. Output of cars during 1958 is reported to have exceeded a million for the first time in the history of the industry.

The greater measure of credit freedom now prevailing gives hopes for further progress. The recent relaxation of hire purchase controls should also stimulate industrial activity on a national scale.

This trend was echoed recently by Mr. W. Edgar Hale, chairman of Hale & Hale (Tipton), Ltd., who, in his recent annual review, said, 'I think that world trade will expand generally, and, particularly in the case of our country, the future should be bright provided our costs of production can be kept around present-day values'.

Here, indeed, is the crux of the matter. Keeping costs down is a duty of the first importance, and one that cannot be shirked by any forward-looking industry. Severe competition is now being encountered by many industries, particularly in overseas markets. This competition must be squarely faced if our national prosperity is to continue.

It is not without significance that in many firms where progress has been made during the past year, tribute has been paid to the vital part played by plant modernization in keeping manufacturing costs down in the face of rising material costs and increased wage bills. Freer credit can aid this progress by stimulating capital investment and product sales alike. The use of even a small proportion of this investment potential for the installation of improved handling facilities will be amply repaid in the years to come. It is up to industry to seize any such opportunities that may present themselves during the coming year.

SEVENTH MECHANICAL HANDLING EXHIBITION

(Organized by this journal)

The Seventh Mechanical Handling Exhibition will be held in May 1960 at Earls Court, London, S.W. The actual dates have not yet been finalized, but will be announced at the earliest opportunity in this journal.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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HANDLING IN A TELEVISION TUBE FACTORY

Inter-process handling and processing on conveyors at the new Sunderland works of Siemens Edison Swan, Ltd.

As REPORTED recently,* the new glass sealing plant at the Sunderland television tube factory of Siemens Edison Swan, Ltd., has now been completed, adding a further 100,000 sq. ft. to the 250,000 sq. ft. of floor area brought into operation in 1956.

Production of television cathode ray tubes at the factory is at present running at 12,000 a week, considerable use being made of automatic processes linked together by nearly two miles of overhead chain conveyors. In some cases, intermediate processes are carried out automatically while the tubes are on the conveyors travelling between one stage of manufacture and another.

The conveyors, with two exceptions, are of the Teleflex dual directional type running at speeds varying between 6 and 40 ft/min. The exceptions are two 'Teleline' cable conveyors serving the glass sealing plant. Some of the Teleflex chain conveyors are floor-mounted, instead of being suspended from overhead, the tubes in this case being conveyed in special carriers mounted on top of the chain. Conveyor details are briefly given in Appendix 'A'.

The spacing of the load carriers varies in multiples of 8 in, the most usual pitch between carriers being 2 ft 8 in.

In most cases, normal 90- or 180-deg drive units are fitted. In five instances, however, the layout of the conveyors does not permit the use of this type of drive and caterpillar drive units are therefore applied to straight sections of conveyor in these cases.

The caterpillar drives are of two types; (1) the normal chain and dog assembly, arranged horizontally, and applying the drive to the main chain through the side wall of the conveyor track, (2) an extra heavy-duty chain and dog drive assembly, mounted vertically, in which the drive is applied from above the chain, the dogs reaching down to engage with the vertical spider which forms an integral part of the chain construction and on which the chain rollers are mounted. At the Sunderland factory three of the former kind and two of the latter, heavy duty, types of caterpillar drive are employed.

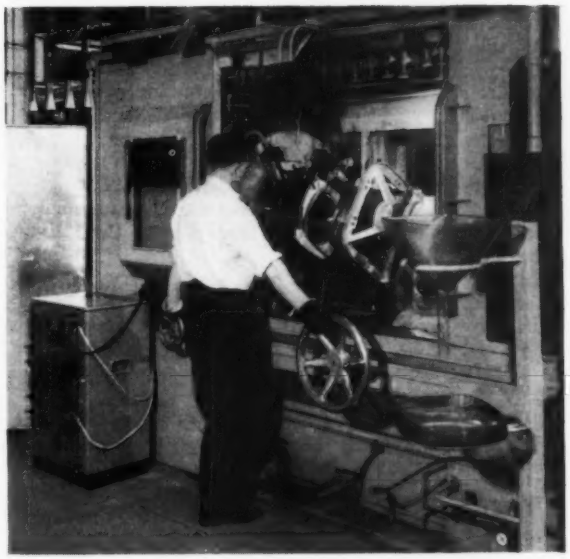
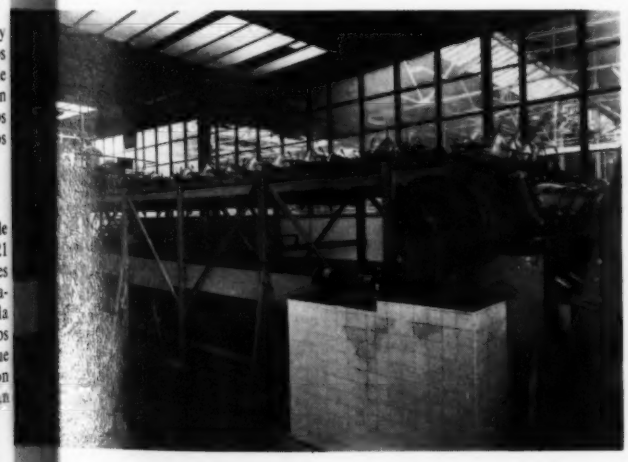


Fig. 1. Joining faces and backs of tube bulbs by the automatic arc welding process. The two components before being joined together are seen on the stand at the right of the photograph

Fig. 2. A view of the screening conveyor showing bulbs on point of decanting at drive terminal



Glass Sealing Plant

A simplified flow diagram showing the principal processes involved is given in Fig. 4. As indicated, glasswork for the cathode ray tubes is received at the factory in the form of three separate parts, face, back and neck.

These components are first placed in pre-heating ovens and brought slowly to an appropriate temperature. The backs are then joined to the necks on horizontal glass lathes or rotary machines, and transferred to a specially designed rotary indexing machine which automatically punches an anode hole in the back of the tubes and drops into position the anode button. Localized heating prior to the punching of the anode hole is carried out at successive stations on

* *Mechanical Handling*, November 1958, page 773.

the machine at increasing intensities. The weight of the anode button on the heated glass causes it to fall slightly into the tube, and at the final indexing stage a vacuum is applied above the anode button to raise it back to the correct level on the surface of the tube.

The completed backs are subsequently passed through an anealing lehr and joined to the pre-heated faces by an automatic electric arc welding process (Fig. 1). The finished bulbs then travel through a further lehr which gradually cools them after holding them for a certain period at a high temperature in order to allow the glass to 'settle'.

After cooling, the bulbs are transferred by overhead chain conveyor to the bulb washing section (which is in another building) where surface contamination is removed. This, again, is achieved on rotary indexing machines which subject the bulbs to various jets of chemicals and demineralized water rinses.

The next stage after bulb-washing is screening, which is carried out on a large horizontal conveyor (Fig. 2). The upturned tubes are secured on the conveyor by clamps and are partly filled with barium acetate and water in quantities according to tube size. Phosphor powder and silicate are then added and the mixture allowed to settle for 20 minutes while travelling slowly on the conveyor.

With the screen now formed, the tube reaches the end of the conveyor. Decantation of the liquids takes place automatically as the tubes pass over the drive terminal to return on the underside of the conveyor to the take-off point.

On their way to the next process the tubes are inspected under fluorescent light while travelling on an overhead chain conveyor. They are then removed from the conveyor and the screen coated internally with an acrylic solution which protects the screen at the subsequent aluminizing operation.

For drying out, prior to aluminizing, the tubes are placed on a floor-mounted Teleflex chain conveyor equipped with hot air pokers on each load carrier. Each poker has its own electric heating element through which the air is passed into the cathode ray tube, the heater being switched on and off automatically.

At the next stage, Aquadag, a graphite solution, is applied inside the neck of each tube to give contact between the anode button and the electron gun which is inserted later.

The aluminizing process, which follows, is carried out on rotary indexing machines affording several stages of evacuation. After a vacuum check, the aluminium is volatilized, thus coating the inside of the back of the tube and forming a mirror behind the screen. This enhances the brightness of the screen when the television set is in use, and makes for better viewing.

Aluminized tubes are now fed into a 120-ft long bake lehr and receive a four-hour treatment, during which the protective acrylic covering is evaporated from the screen (see Fig. 3). A rigid inspection with the aid of ultra violet light now takes place, and only those screens which are absolutely free from blemish are allowed to go forward.

Inserting the Electron Gun

The electron guns, which comprise the anodes, grid, cathode and heater, are now inserted into the necks of the tubes. These 'mount assemblies' arrive complete from another Siemens Edison Swan factory in Sunderland. The marrying

Fig. 3. A point in the factory where a number of the overhead conveyors converge. The long oven is the final bake lehr, which is the stage that follows aluminizing

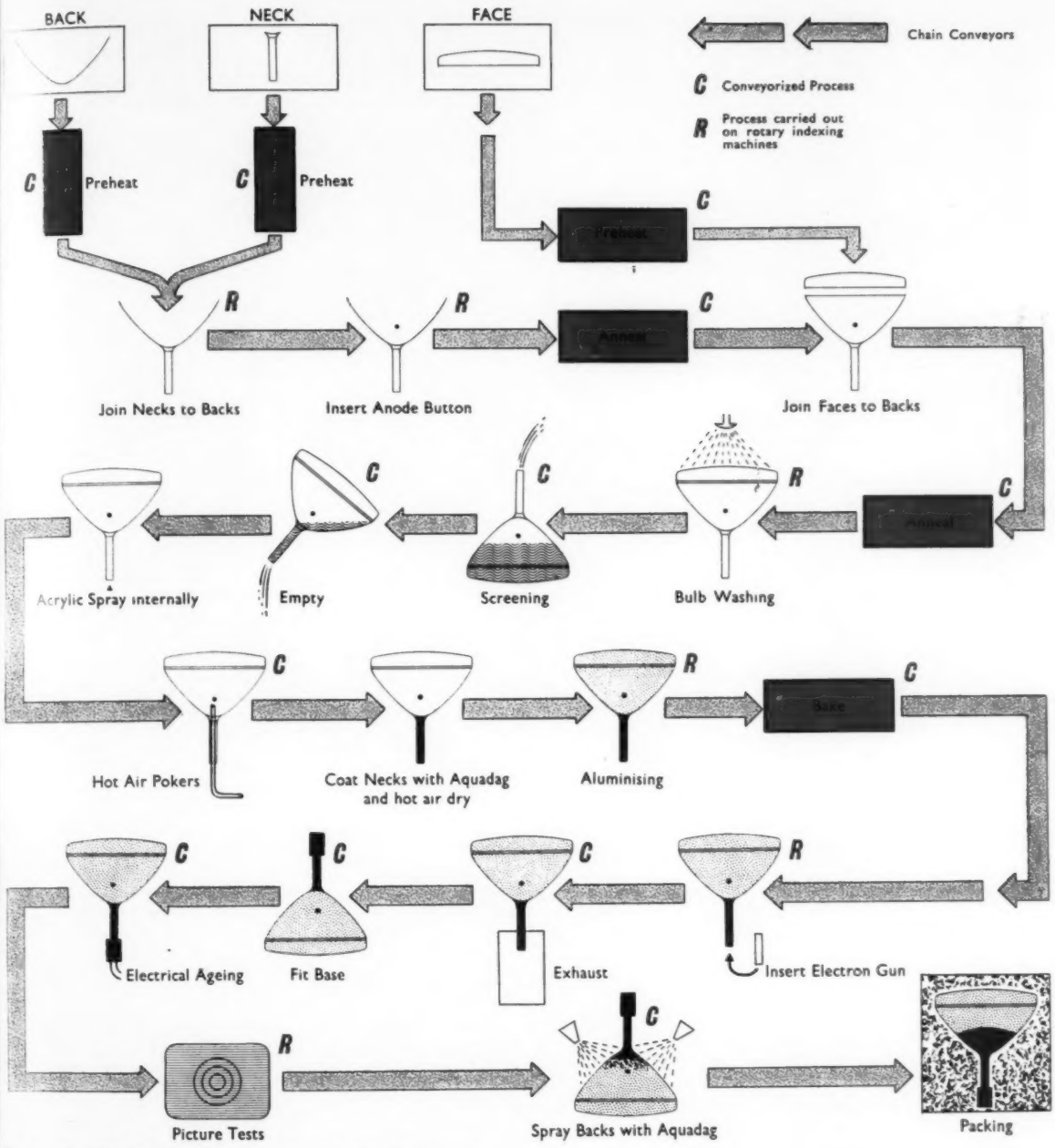


Fig. 4. Simplified flow diagram showing sequence of main processes

of gun to neck is an extremely fine operation with little permissible tolerance as it is at this point that the distance from gun to screen is set.

Evacuation of the tube follows on two in-line exhaust machines (Figs. 5 and 6). These embody conveyors carrying 159 exhaust cubicles each. Every cubical is an exhaust machine in its own right and moves round one station at regular intervals of between 30 and 60 sec. Different size tubes can be evacuated simultaneously on the in-line machines as each cubicle may be separately adjusted. For servicing purposes, each cubicle can be simply unplugged from the conveyor system and wheeled away while another one is plugged in.

During the evacuation process not only is it necessary to remove the air, but also to heat all parts inside and outside to various temperatures by means of radio frequency heating and external baking of the bulb. The cap base is now added, after which radio-frequency heating of the barium getter is carried out to remove from the tube any final traces of residual gas.

Electrical Ageing

Electrical ageing or 'running in' of the tube follows, the object being to stabilize tubes which are in various stages of activation. Complete electrical and picture tests are then made. Before dimensional inspection, the conical section of the bulb is externally spray-coated with Aquadag to a specified thickness. This is carried out on a floor-mounted dual-directional chain conveyor passing through a spray booth. The coating provides the television set makers

Fig. 6. A view of the two in-line exhaust machines

with a ready-made capacitance between the internal aluminium film and the external Aquadag.

At the packing station, the tube undergoes a final inspection. Finished tubes are then packed and despatched either in single boxes or in the more economical multi-packs which take 6, 12 or 15, according to the type of tube.

The cathode ray tubes are marketed under the trade name Ediswan-Mazda, and the one-millionth tube to be made in the factory, since manufacture began three years ago, was completed in September 1958.

Suppliers

Some of the principal suppliers of equipment mentioned in the text are as follows:—

Dual Directional Chain Conveyors..Teleflex Products, Ltd.
Screening Conveyor.....Stordy Engineering Co., Ltd.
In-Line Exhaust Machines....Stordy Engineering Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.
Annealing Lehrs....Abisch Conveyor & Furnace Co., Ltd., and Modern Mechanization, Ltd.
Bake Lehrs.....Stein & Atkinson, Ltd.

Fig. 5. Front view of an in-line exhaust machine showing the self-contained 'cubicles' with tubes in position

Appendix 'A': Principal Conveyor Details

	Speed	Length	h.p.
Conveyors serving glass sealing plant			
1.	20 f.p.m.	601 ft	2
2.	20 f.p.m.	592 ft	1½*
3.	22 f.p.m.	1,752 ft	2 drives of 3 h.p. each*
4.	4 f.p.m.	144 ft	½ (Teleline conveyor)
5.	4 f.p.m.	47 ft	½ (Teleline conveyor)
Conveyors serving subsequent processes			
6.	20 f.p.m.	590 ft	2
7.	30 f.p.m.	508 ft	1½*
8.	6 f.p.m.	334 ft	Common drive unit, 2 h.p.
9.	6 f.p.m.†	222 ft	
10.	30 f.p.m.	652 ft	1
11.	40 f.p.m.	242 ft	2½*
12.	6 f.p.m.	160 ft	2
13.	6 f.p.m.	352 ft	2
14.	9 f.p.m.	318 ft	1½
15.	30 f.p.m.	747 ft	2
16.	20 f.p.m.	186 ft	2
17.	6 f.p.m.‡	162 ft	2

* These conveyors are fitted with a ball bearing chain, which accounts for their low horsepower. They are driven by caterpillar type drive units.
† Floor-mounted for part of run (equipped with hot-air pokers).
‡ Floor-mounted (serving final Aquadag spray booth).

K. MUMBY

UTOMATIC CHIPBOARD-MAKING PROCESS

e Plimber process for the manufacture of chipboard, quality control and ost production are achieved by employing fully automatic servo systems continuous manufacturing sequence. From the discharge of chips from the ge silo to the trimming of the finished boards, the materials move through a egulating series of operations. Apart from reception, storage, and dis- ion sections (which are themselves fully mechanized) the factory is 100 *nt automatic.*

N DEVELOPING the method of chipboard manufacture now in operation in their works at Rainham, Essex, British Plimber, Ltd., have made a notable contribution to the technology of automatic production.* Though reaching a fullness of automation never before approached in the British wood-chipboard industry, the Plimber system entails a capital cost that is sensibly related to output value and has achieved operational procedures of commendable simplicity that afford ample flexibility for the accommodation of changes in the production programme.

Flexibility extends to both the raw material and the finished product, and permits either high-density homogeneous boards or low-density three-layer sandwich boards to be made from mill waste or 'first intention' wood chips. Though at present operating on waste material, the Rainham plant can, if and when required, be modified by the interpolation of the necessary equipment to accept raw material drawn, for example, from forestry thinnings.

In accepting waste material from diverse sources, from which consistency cannot be expected, some formidable technical problems were met and overcome. In the feeding of the materials in correct increments and proportions to the moulds in which they are compressed, a remarkably high degree of accuracy is maintained, and this also represents a considerable technical achievement. Furthermore, by providing a rate of throughput of up to 5 tons/hr, the Plimber process affords a highly acceptable efficiency factor in terms of manufacturing economy, considered in relation both to first cost and to the costs of production.

Processes Involved

Before it is acceptable for chipboard manufacture, the raw material must undergo pre-processing treatment for the removal firstly of large lumps of wood and metallic inclusions, and secondly, of surplus water. After screening, the chips are passed through a drier in which the moisture content is reduced from a peak of 40 per cent or an average of 25 per cent to a uniform level of 7 per cent. They must then be graded for size into three groups. Chips in the smallest size-group are used to form the two outer layers of low-density boards, those in the largest are ideal for forming the core of the sandwich, and the remainder must be reduced by milling to supplement the material in the first group. Some of the large chips must be milled also, to provide material for high-density homogeneous boards.

Fig. 1. View of section of chip-storage area, showing two of the rotary bin-dischargers feeding on to reclaim conveyors, with rubber belt continuously supported by steel base, by which material is transported to drier seen in background. Recirculating conveyor can be seen in middle distance

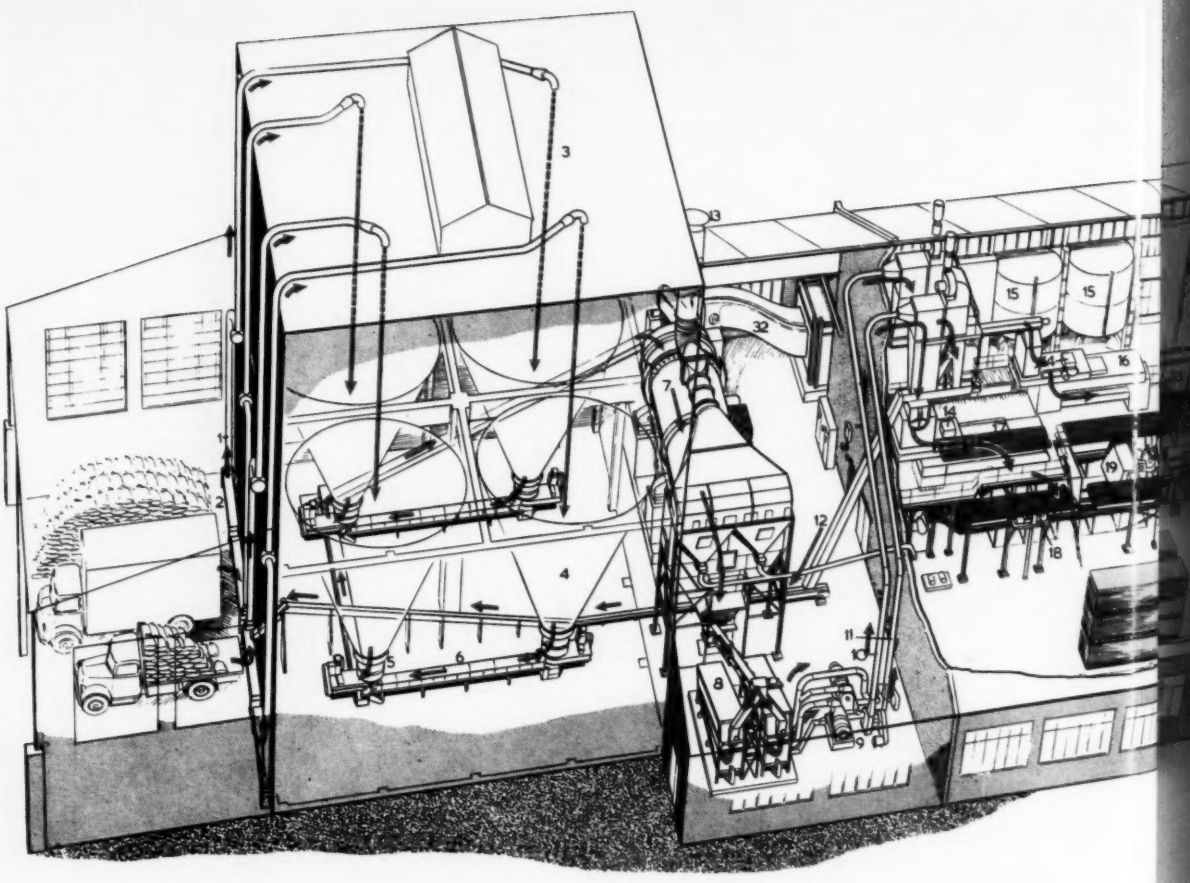
Chips for these various purposes, in the required proportions, must be passed through cyclones for the removal of dust and delivered at a predetermined rate to mixers, where measured quantities of resin and other liquid additives are incorporated.

The material is now ready for moulding and compressing. It is spread in the moulds in precisely regulated quantities, and in layers of uniform or alternating particle sizes, as required. The moulded biscuits are loaded into a cold pre-press, after which the compressed boards, stripped of their moulds, are passed into a main press with platens heated by high-pressure hot water to a temperature of 285 deg F. In each press they are subjected to a platen pressure of 40 tons/sq. ft.

Speed at this stage is essential to the production of a good board. The 12-daylight curing press is closed, and the full pressure of 40 tons/sq. in. is applied, in the space of 16 sec. The curing cycle is completed in 9 min or 12 min, according to the thickness of the biscuit, after which the boards are ejected and cooled, and transferred to the saw for cutting and trimming.

Once initiated, the entire sequence of operations that we have described, up to the ejection of the cured boards, proceeds continuously and automatically under strictly governed time-control.

* As we go to press, we are informed that a company known as British Plimber Processes, Ltd., Rainham, Essex, has been formed, in association with British manufacturers who had participated in this project, for the purpose of introducing the technique and exploiting the process in countries outside the United Kingdom.



Layout of Plant

In Fig. 2 our artist shows how the machines and equipment are disposed and the direction in which the material flows through the automatic processing plant. Chips are unloaded and stored at the south end of the building and pass northward through the drying and grading and other pre-processing stations and the sections devoted to mixing and spreading. The cold and hot presses and stripping machinery occupy an area of approximately 90 ft × 18 ft, leaving an area of approximately 36 ft × 24 ft for preparing the products for storage and dispatch. Warehousing arrangements are at present on a temporary basis, pending the building of extensions on the company's 5-acre site.

To ensure the plant against the effects of a possible hold-up in deliveries, mechanized storage accommodation that is far in excess of normal practice has been made available for the raw material. It has not yet been possible to secure bulk delivery of all the raw chips, and some of the supplies arrive in sacks. All the material is, however, stored in bulk in a huge rectangular silo, of several hundred tons capacity, which rises upward some 22 ft above the general level of the building.

For convenience in following the movement of material through the plant, it will be useful to break the various activities down into four main phases: (1) reception and storage; (2) pre-processing; (3) manufacture into boards; (4) storage and despatch. These delimitations are, of course, purely arbitrary, since phases (2) and (3) are in reality fully integrated and continuous.

Phase 1: Reception and Storage

Chips delivered in bulk or bags are discharged on to belt conveyors for preliminary dressing, large chunks of wood and off-cuts, which might damage machinery, being removed by taking advantage of the difference in mass between acceptable material and inclusions. There are four intake belt conveyors, each delivering the material to one of four pneumatic conveyors by which it is sucked to intake points at the top of the silo, some 60 ft above ground level.

The lower part of the silo, which is of reinforced concrete construction, is divided into four conical bins, two of which can be seen in Fig. 1, through which the material is discharged for distribution. Dust is discharged to atmosphere via dust-collectors on the roof.

Chips are a peculiarly difficult material to store in silos and will, under certain conditions, bind solid. It was only after fitting arch-breakers of exceptional size—23 ft 6 in long—and providing very steep angles to the chutes that this trouble was overcome. Free flow through the conical bins is obtained by means of rotary bin-dischargers. Two of the dischargers provide an infinitely variable flow-rate from zero to 3 tons/hr and the other two are adjustable to give outputs of 2-3 tons/hr. They thus allow the feed to the drier to be controlled up to the specified maximum rate of 5 tons/hr. This arrangement has the further advantage of providing means of controlling the levels in the silo and, within certain limits, selecting chips by their size and moisture content.

Phase 2: Pre-processing

Belt conveyors transport the chips to a rotary dryer, seen in Fig. 1, in which the excess moisture is removed by forced convection. Exacting demands are made of this equipment, which is required to reduce the moisture content from

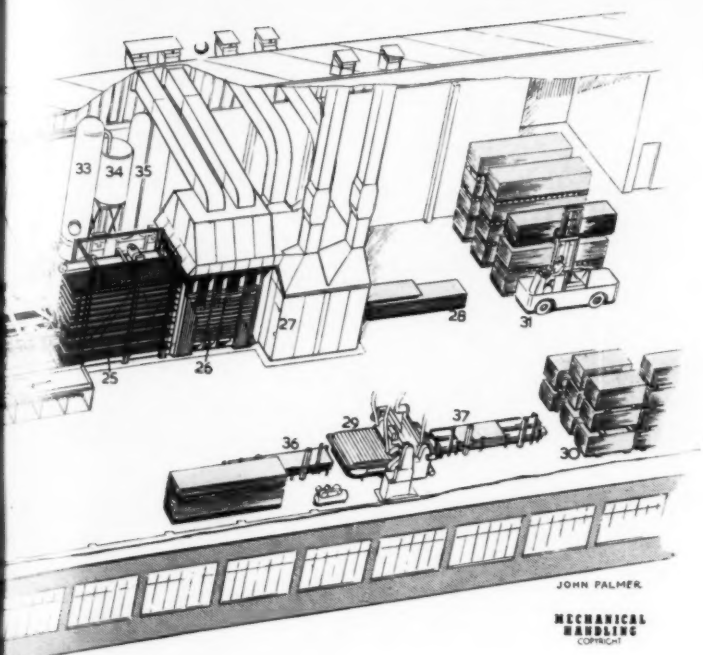


Fig. 2. Visual interpretation by our artist, John Palmer, of the layout of the chipboard manufacturing plant at the Rainham works of British Plimber, Ltd. From the point at which raw chips are discharged from the silo to that at which the compressed 16-ft × 4-ft boards are delivered by the cooler and unloader, the entire process is fully automatic

KEY
1. Pneumatic chip-elevators
2. Chip-intake belt conveyors
3. Chip storage silo
4. Chip storage bins
5. Rotary bin-dischargers
6. Chip-reclaim conveyors
7. Rotating-louvre drier
8. Centrifugal dressers
9. Mills
10. Pneumatic surface-chips conveyor
11. Pneumatic core-chips conveyor
12. Overspill conveyor leading to recirculating conveyor
13. Exhaust to atmosphere from drier and multi-cyclones
14. Input weighers
15. Resin tanks
16. Surface-layer mixing tank
17. Core mixing tank
18. Stirred bunkers
19. Bottom-surface spreader-weigher
20. Core spreader-weigher
21. Chain-driven mould conveyor
22. Frame and caul traverse-conveyors
23. Control desks for mould-transporting and pressing sections
24. Pre-press
25. Main-press loader
26. 12-daylight hot press
27. Press unloader and cooler
28. Uncut boards on stillage
29. Automatic saw
30. Cut and trimmed boards on dunnage
31. Side-loading fork lift truck
32. Hot-air inlet
33. Low-pressure accumulator
34. Water tank for hydraulic system
35. High-pressure accumulators
36. Automatic feed to saw
37. Automatic unloader

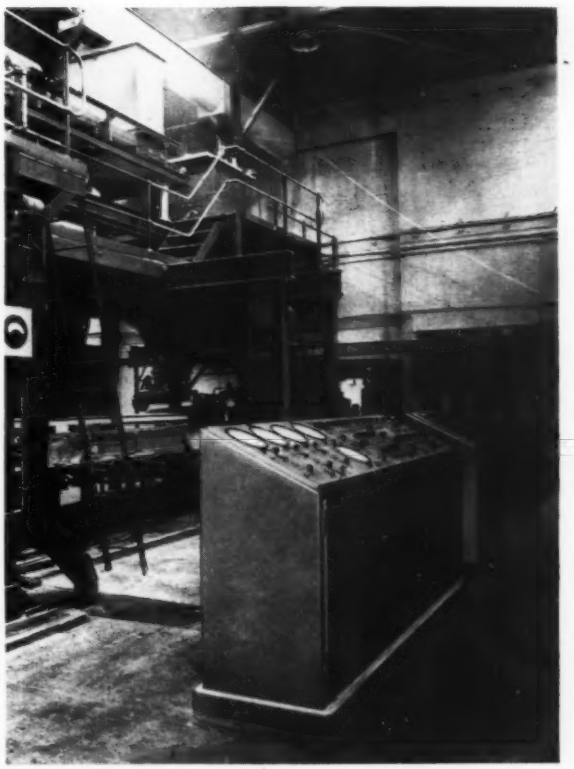
BELOW
Fig. 3. Control desks for chip-preparation processes and part of the production plant, including surface-chips input conveyor, continuous weigher and mixer

40 per cent to 7 per cent intermittently, or from 25 per cent to 7 per cent continuously, at the maximum flow-rate of 5 tons/hr. The chips are rotated continuously as hot air is passed through them at automatically controlled temperature and volume.

Chips emerging from the drier will normally be taken by belt conveyor to the rotary dressers for grading, but batches that are not fully dried out can be diverted by means of a short reversing belt to a recirculating conveyor that returns them to the silo intake system. Any breakdown on the production plant causes the material to be diverted automatically to recirculation, thus preventing a pile-up at the drier outlet and averting the possible necessity of stopping the drier suddenly and thereby incurring the risk of fire.

Material delivered to the dressers passes over wire-mesh screens, after which the graded chips are separated into three streams. The first contains material of the smallest size, which is used without further preparatory treatment for the outer layers of the low-density sandwich boards and is conveyed pneumatically to the main processing plant. The second stream contains chips for milling, and provision is made for regulating the combined total of the two streams. The large material in the third stream goes either to the main plant for providing the core of the sandwich, or to the mills for reducing to the size specified for homogeneous use. Hand-set and automatically controlled diverter plates can be used in conjunction with adjustment of the screen sizes to obtain any required combinations of sizes and quantities in core and surface-layer material.

After passing through cyclones, which rid them of the dust raised by milling, the graded core and surface materials are ready for incorporation in chipboard.



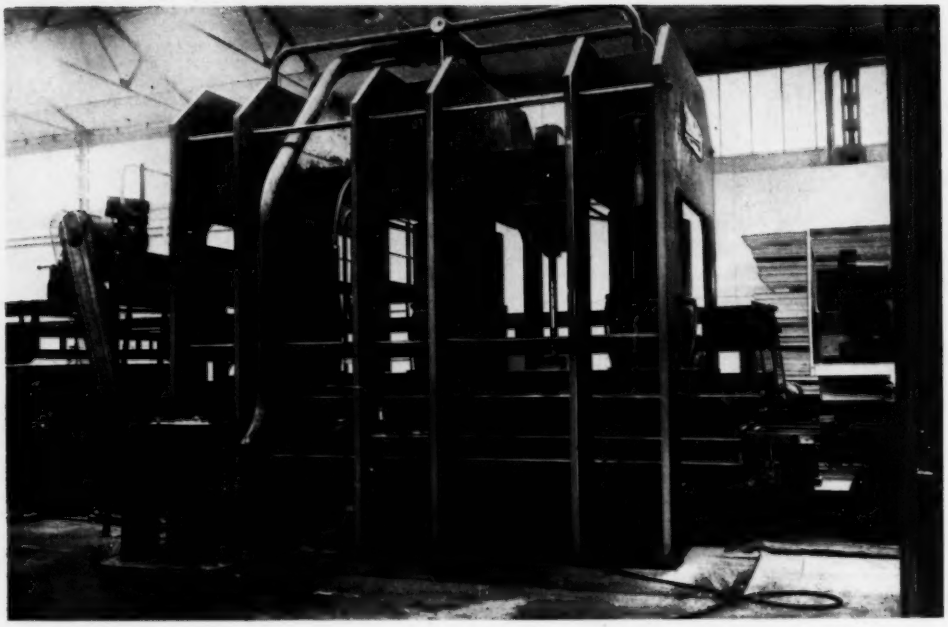


Fig. 4. Pre-press by which biscuits are subjected to a pressure of 40 tons/sq. ft.

Phase 3: Manufacture into Boards

On leaving the cyclones, the two streams of graded chips are fed on to continuous belt weighers, which can be preset by remote control to deliver a predetermined weight of material an hour to the mixers. This part of the production line is shown in Fig. 3.

Resin and other additives are delivered to the mixers by pumps provided with variable-speed drives and flow-meters. These devices enable a continuous flow of ingredients to be maintained automatically in the required proportions, which can be preset from a remote control panel.

Emerging from the mixers as chips coated with resin, the core and surface materials are ready for moulding. At this stage any irregularities in the delivery rate would be reflected in a lack of uniformity in the finished product, which must be held consistently and accurately to the specified size, weight, and density.

Minor fluctuations are absorbed by passing the resinated chips through bunkers equipped with stirrers, by which they are maintained in their free-flowing state. They are then transferred to continuous belt-weighers and spreaders. The weighers exert accurate control over the delivery rate. The spreaders, variable-speed conveyors with belts equal in width to the width of the moulds, deposit the material upon them in an even layer. They stop and start in synchronism with the intermittent motion of the mould conveyor that feeds the presses.

When the line is set up for sandwich boards, surface material is drawn from its bunker by the first and third spreaders and core material is handled by the second spreader. When homogeneous board is produced, the sequence is the same, but all three spreaders are delivering identical material.

The action of the spreaders cannot properly be considered without that of the moulds that pass beneath them Each mould, consisting of a base, or caul, and a removable perimeter frame, accommodates a standard production unit—a sheet 16 ft long × 4 ft wide, plus cutting and trimming allowances, which will make two finished boards of 8 ft × 4 ft standard size and $\frac{1}{2}$ in or $\frac{3}{4}$ in thickness. The moulds are carried forward on pusher-dog chain conveyors set out in two parallel lines and bridged at each end by transverse transfer sections.

As they move down one of the conveyor lines, the moulds pass under the first and second spreaders, which deliver the lower surface layer and the core. They are then taken across the bridge by the transverse conveyor and travel in the reverse direction up the opposite track to receive the upper surface layer of the sandwich from the third spreader. At this stage nearly 200 lb of resinated chips will be spread evenly in the mould to a depth of about 5 in to form a $\frac{3}{4}$-in board.

The motions are beautifully synchronized, so that as the mould passes beneath it the spreader belt is started up and deposits a layer of material precisely and evenly on the base of the mould, stopping as it started at exactly the right moment. The speed and interval-frequency of the mould conveyor is governed by the capacity of the press.

Each mould is loaded automatically into the single-daylight press illustrated in Fig. 4 for the cold pre-pressing operation by which the chips are subjected to a pressure of about 40 tons/sq. ft. While the biscuit is still under pressure, the side frame is stripped and taken up by a higher-level conveyor serving the transfer section. When clear of the pre-press, the caul is withdrawn sideways from under the biscuit and traversed to the parallel return section of the conveyor. The frame is carried across at the higher level and lowered on to the caul at the end of the traverse. Thus reassembled, the mould is ready to move along the line for refilling. Views of this section of the plant can be seen in Figs. 5, 6, 7, and 8, and details of the transfer mechanisms are shown in close-up in Figs. 9 and 10.

The biscuit, meanwhile, is ready for curing in the 12-daylight hot press, which is loaded with 12-unit batches. This operation also is accomplished without interrupting the automatic sequence. Each biscuit, as it stands at the loading station with its caul removed, is pushed on to one of the 12 decks of the telescopic loader. The decks are loaded in alternate sequence on the downward and upward strokes, the loader first descending automatically to bring the bottom, third, fifth, seventh, and top shelves into line with the carrying surface of the conveyor and then rising to bring the remaining shelves into alignment. This sequence

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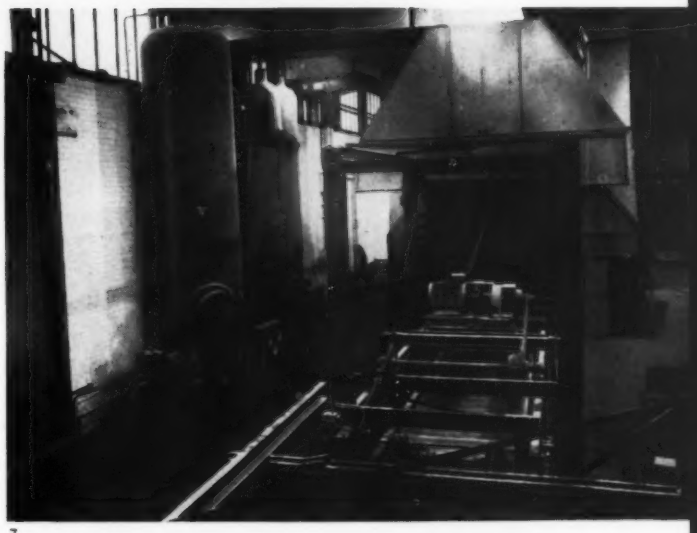
Fig. 5. Traverse, loading and pressing sections, with their control desks. Low-pressure accumulator can be seen on left

Fig. 6. Close-up of transfer and loading sections showing, at extreme left, chains and pushers for traverse of frames and cauls. Loader is partly lowered, the position in which half the shelves have been filled leaving the second part of the batch to be transferred on the upward travel

Fig. 7. View looking down on traverse conveyors and loader. Hydraulic accumulators and water tank can be seen on left of press, which applies a pressure of 40 tons/sq. ft. through platens heated by high-pressure hot water to a temperature of 285 deg F

Fig. 8. Empty moulds assembled ready for filling on chain-driven conveyor, the cauls and frames having been brought across from parallel line at rear. The bottom-surface layer and core will be laid when they have travelled leftward to first and second spreaders, after which the moulds will be traversed to the line that brings them under the upper-surface spreader and into the pre-press seen on the left. Stripped of their moulds, the biscuits will then be transferred in turn to loader, press and unloader-cooler



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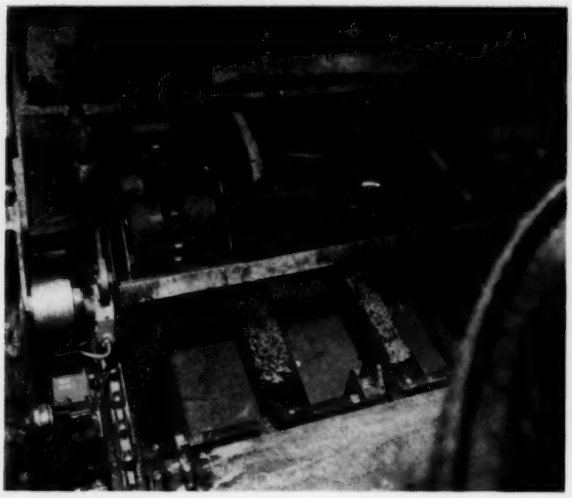

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Fig. 9. Detail showing chain-driven pusher-bar by which biscuits are transferred from conveyor to loader

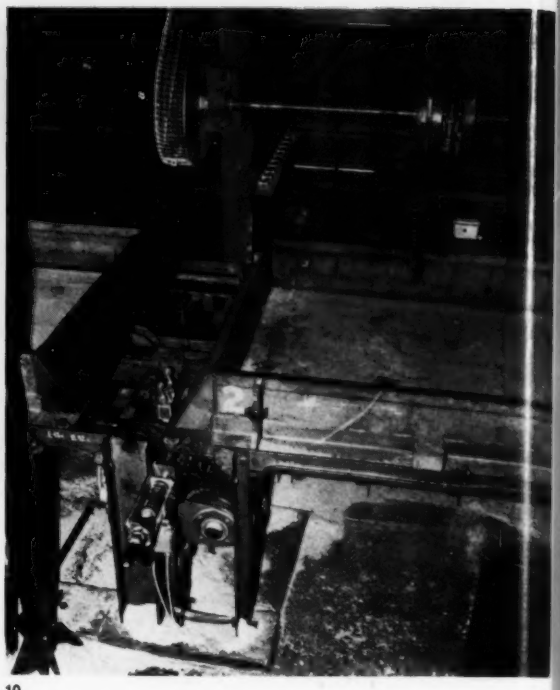

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Fig. 10. Caul and frame assembled after traverse. Details of traverse mechanism, limit switches and pusher-dog on chain conveyor can be seen in this picture

Fig. 11. Doors of unloader and cooler opened to show interior

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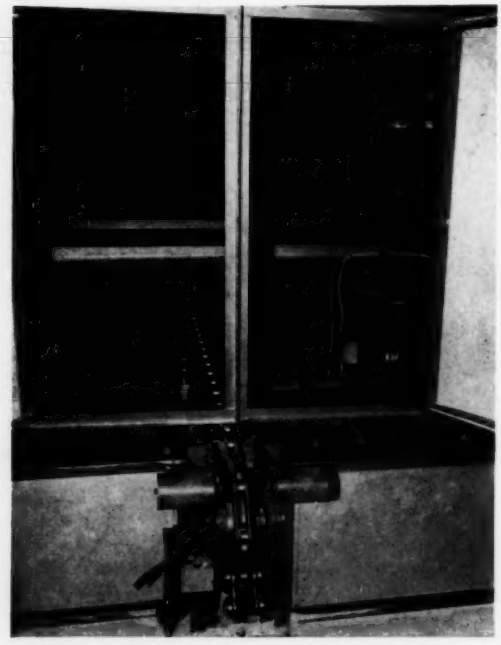


ensures that the hydraulically operated loader travels a uniform minimum distance at each movement in the loading cycle.

When it has received its full complement of biscuits, the loader transfers the entire batch to the openings of the hot press, the cured boards from the previous pressing being ejected simultaneously into an unloader. This piece of equipment, which is fitted with a cooling hood, operates on the same principle as the loader. The photograph reproduced in Fig. 11 was taken with the doors opened to provide a view of the interior.

The presses, loader, and unloader, are hydraulically operated by water delivered from hydropneumatic accumulators at pressures of 750 p.s.i. and 4,500 p.s.i. The accumulators, which can be seen in Figs. 5 and 7, are recharged automatically by electrically driven pumps. The lower pressure is used for closing the daylight in both presses and raising and lowering the loader and unloader. Water is introduced at the high pressure to enable the presses to develop their maximum compressive force of 40 tons/sq. in. with the necessary speed. Pumps and air-compressors, and the boiler for the high-pressure hot water system, can be seen in Fig. 12.

Every operation in the entire production sequence conforms to a strictly controlled time schedule that forms part of the closely integrated system by which all the manufacturing processes are kept in phase. This will be outlined briefly in another section.

Phase 4: Storage and Despatch

On discharge from the unloader the boards, though reduced in temperature, are still too hot to withstand finishing treatment, and are left to cool on the long full-perimeter pallets on to which they were discharged before being loaded on to the automatic saw, seen in Fig. 13, by which they are cut in half to form boards of the standard 8-ft × 4-ft size, and their rough edges are trimmed. This saw is capable of making the five cuts per board—one sizing and four trimming—at a speed comparable with the general rate of production, which, for ½-in boards produced under automatic operation, is a board every 45 sec.

The work is expedited by loading and unloading lifts, which operate automatically in synchronism with the saw. Boards stacked on the loading lift are fed automatically to the saw and the finished units are discharged and formed into piles on the second lift.

Boards cut to length, as distinct from the 16-ft production units coming off the press, are stacked on dunnages to await despatch. Uncut and finished boards are handled by

the side-loading fork lift truck seen in Fig. 14. The side-loader is well adapted to this type of load, and can pick up and stack 8-ft or 16-ft units and transport them on its long platform without risk of damage.

Controls

The timber process is fully automatic and self-regulating, from the gathering of chips from the silo to the unloading of chipboard from the hot press. Within these limits all functions are interlocked in a continuous time-controlled sequence and can proceed without human intervention. Beyond the points of demarcation at either end of the manufacturing cycle are the intake and storage of raw materials, the sizing and trimming of the final product and its warehousing and despatch, and wherever possible operations in these spheres proceed automatically under push-button control.

Despite the high degree of automation that has been achieved, facilities are provided for testing and running every piece of plant under manual control. Thus full flexibility can be introduced immediately into any part of the system.

Motor-contactors and relays for hand and automatic operation, with the necessary indicators and switches, are set up at five main stations, covering the entire production plant, under the following groups:

(1) Chip handling and preparation plant, including the rotary bin-dischargers; gathering, distributing, re-circulating and reversing conveyors; driers and dressers, with their conveyors; stirrers; belt-weighers; and spreader-conveyors.

(2) Liquid handling and mixing equipment; pumps for

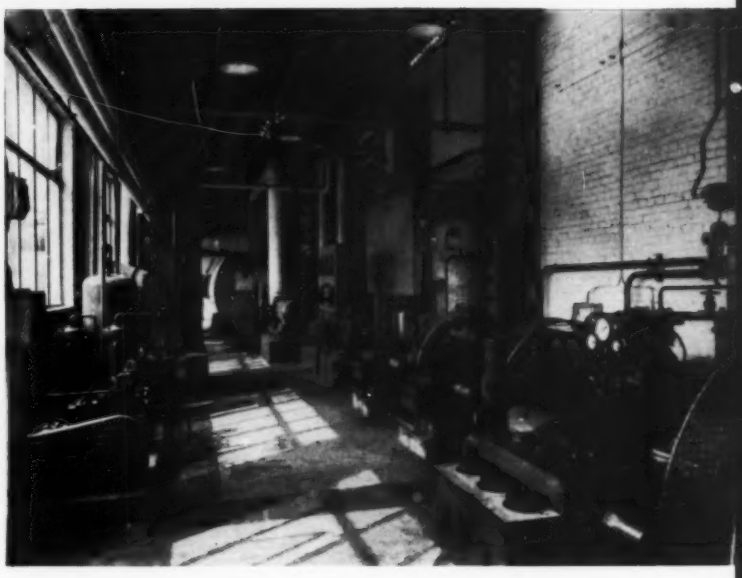
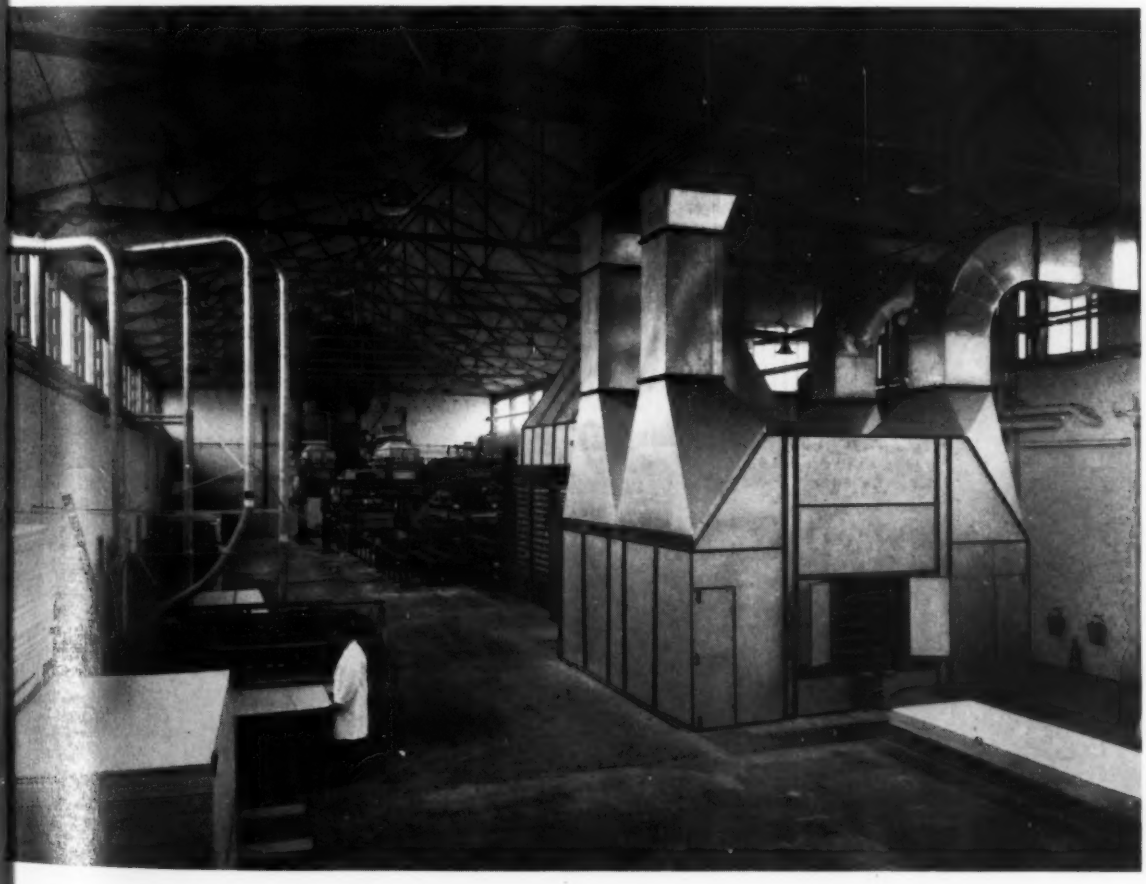


Fig. 12. Pump room and boiler house. In right foreground are the high-pressure and medium-pressure hydraulic pumps; on the left, the twin compressor-set for the air-operated instruments. Control panel for high-pressure hot-water system can be seen in middle distance and, in background, the economic-type boiler with induced-draught fan

Fig. 13. General view of automatic production line, looking backward from cooler in foreground toward chip-preparation plant in far distance. Automatic saw is in operation on left



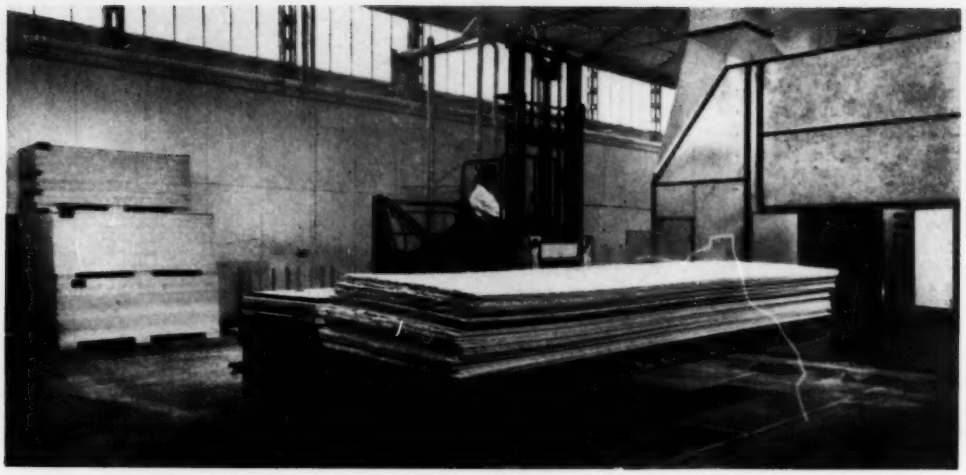


Fig. 14. *Two batches of* 16-*ft* × 8-*ft boards on forks of side-loader*

feeding resin and other ingredients to the mixers; stirrers; valves in the water lines. The pumps respond under relay signals to the level in the mixing tanks.

(3, 4) Cold pre-press and hot main press, hydraulically operated under the control of electromagnetic pilot valves. Subsidiary control panels are provided for the remote stopping and starting of the pumps and the setting of the working pressures.

(5) Mould-handling equipment; mould conveyors; frame and base return conveyor; loaders and unloader.

Normally, the plant is started up and shut down in stages, but provision is made for simultaneous stopping of all sections in the event of an emergency. Interlocks protect various sections of the plant against the effects of failure in other sections. The recirculating conveyor can be used as a bypass to which the main chip intake can be diverted, and thus acts as a safety valve to protect the production plant against overloading.

Thus the stopping of sections 3, 4, or 5, or the overloading of a motor in any of these sections, shuts down the preceeding sections and causes the plant to revert to recirculation. If a motor in the recirculation group becomes overloaded, the entire plant is shut down.

Protection is provided also against feed failure of one or more ingredients. The pumps delivering liquids stop when the mixing tanks are full and are restarted automatically when the level drops. Feed pumps are interlocked with the pumps transferring mixed ingredients to the stirred service tanks in such a way that the transfer cannot take place if proper mixing has not been effected. If the stirred tanks empty below a safe level, the production system stops, but a switch is provided to allow mixing and ready-use service tanks to be emptied at the end of a run by shutting down the feed-pump motors and water valves. If a fault is signalled in the spreader weigh-belt, which will usually be due to a failure of the supply of resinated chips, the presses and mould-handling plant controlled from panels 3, 4 and 5 are shut down.

Faults in any part of the system operate appropriate interlocked relays and all faults are signalled by warning lights, with or without sirens.

Credits and Acknowledgments

Credit for this interesting and enterprising project must be shared by the technical staff and works manager of British Plimber, Ltd., who were jointly and variously responsible for the conception and design of the plant and for putting it into operation.

To them and to the directors of British Plimber, Ltd., the author is indebted for information made available and facilities extended.

Consulting engineers for the project were Griffin, Smith & Partners, Ltd., of London. Suppliers of the principal plant and equipment are listed below.

William Gardner & Sons (Gloucester), Ltd., Bristol Road, Gloucester, were the main contractors for the chip preparation plant, including dressers, millers, weighers, stirred ready-use tanks, spreaders and intake, reversing and recirculating conveyors, all of which was supplied to British Plimber specifications.

Subcontractors to William Gardner were Miracle Mills, Ltd., London, who supplied the two sets of milling equipment; Richard Simon & Sons, Ltd., Nottingham, producers of the continuous belt weighers used on the input and spreader systems for core and surface chips; and Thermix Industries who supplied rotary valves and fans.

G. N. Haden, London, undertook the installation of the high-pressure hot-water system, incorporating a 7,000,000-B.Th.U. Davy Paxman boiler fired by 3,500-sec oil, with fully automatic burner control. Malcolm & Allen were responsible for the wiring of the electrical installations, for which Pyrotenax insulated cables were employed throughout.

Dunford & Elliott Processes, Ltd., London, supplied the rotating-louvre drier and Loughurst Bros. & Beale, Ltd., Colnbrook, the cooling and dust extraction plant. Redler Conveyors, Ltd., Stroud, produced the rotary bin-discharger and arch-breakers on the storage silo.

Other equipment suppliers were: Allen West & Co., Ltd., Brighton, electric starters; British Quadruplex, Ltd., London, pumps for the liquid ingredients; Böttcher & Gessner, Hamburg, the automatic saw; Broom & Wade, Ltd., High Wycombe, air-compressor instrumentation; J. Collis & Sons, Ltd., London, chip intake and reclaim conveyors; Dallow, Lambert & Co., Ltd., Leicester, chip-elevator fans and 16 'Dustmaster' dust extractors; Hamworthy Engineering Co., Ltd., Poole, air-compressor pump; Lancashire Dynamo & Crypto, Ltd., Manchester electric motors (over 100, fractional to 80 h.p.); Materials Handling Equipment (Great Britain), Ltd., London, Irion side-loading fork lift carrier; Rubery Owen & Co., Ltd., Wrexham, full-perimeter steel pallets.

SOME ECONOMIC CONSIDERATIONS IN PLANNING STORES AND WAREHOUSES

By L. J. HOEFKENS, A.I.Prod.E.*

Once a particular system of handling of materials has been installed it does not follow that this will remain the best or the most economic method. Changing circumstances and working conditions, such as quantities of goods to be handled, frequency of handling or the need for additional space can alter the economic factors which held good at the time of the installation of the original project and which justified its adoption. Investigations and checks can usefully be made at intervals to ascertain whether there are in fact more efficient alternatives available or possible, in the same way that manufacturing methods and techniques are under constant review by specialists in the field of production.

To illustrate what is meant let us take as an example the layout of works stores and the handling methods used in them. It is not generally realized or appreciated that in planning and designing a works store one is inevitably faced with a situation of compromise. A compromise between the cost of building or cost per square foot and the cost of labour or cost per man hour.

In a new project designed without regard to space limitations a comparatively low operating cost could be achieved, but where floor area is at a premium and has to be utilized fully, conditions are usually created which necessitate increased costs of handling materials whether it be manually or by mechanical means thereby incurring enhanced total operating costs.

In a store containing lightweight components, where they are manhandled into and out of static bins which are only 5 ft high and are separated by generous gangways allowing operators to pass each other without hindrance, maximum space is required with minimum labour for a given volume and turnover-rate of stock (Fig. 1). Immediately more material has to be housed in the same area, gangways will have to be closed up or possibly a mezzanine platform erected over the existing area to accommodate the additional bins, and more labour will be required than a straightforward proportional increase to the extra material to be handled (Fig. 2).

If we now look at examples from more modern methods of handling and storage, such as the fork lift truck and pallet system, it will be perhaps even more obvious that this situation of a compromise between the cost of space and the cost of labour is ever present.

With the fork lift truck and pallet system we have two extreme conditions, one the pallet rack and the other the block stack. For a given quantity of pallets and a given

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Fig. 1. View of a store equipped with static bins accessible without a ladder and provided with generous gangways. (Courtesy of Fisher & Ludlow, Ltd.)

Fig. 2. View of a store equipped with static bins similar to Fig. 1, but greater utilization of space is achieved by use of a mezzanine platform. (Courtesy of Fisher & Ludlow, Ltd.)

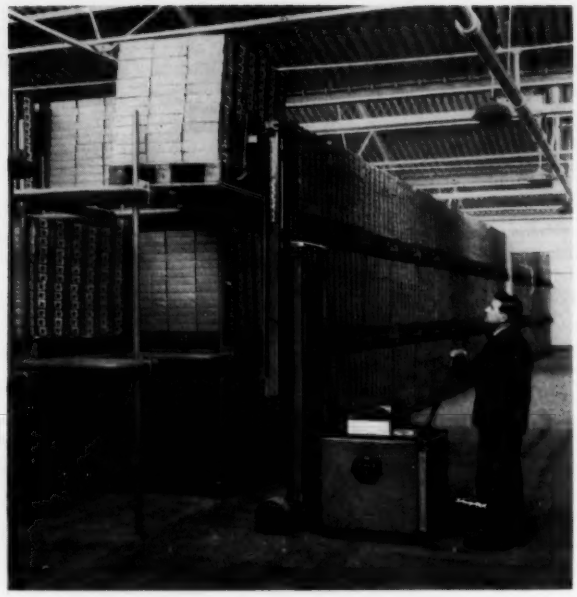


Fig. 3. A pallet rack containing palletized materials. (Courtesy of Tubewrights, Ltd.)

turnover rate of stock the former requires maximum space with minimum labour, the latter requires minimum space with maximum labour.

A pallet rack is very similar in appearance to adjustable scaffolding and forms a row of compartments possibly four or five high, according to the height of the building, into each of which a pallet or a unit load on a pallet can be placed (Fig. 3). This means that a minimum of fork lift truck work has to be expended to place pallets into the rack or to remove them, each being individually accessible. On the other hand as the pallets can only be stacked one deep maximum space is required. It should be mentioned here that pallet racks have been designed so that pallets can be stacked in depth and where the fork lift truck can pass through the rack to obtain access to rows behind the front one, but this rack only has advantages under very special storage conditions and cannot be considered for general application.

As soon as we depart from the pallet rack method and commence to stack the pallets one on another we begin to incur more movement of pallets or more fork lift truck work, hence more labour cost. The pallets now have to be lifted from the stack to obtain the required one and then the balance replaced in the stack. However, the more rows of stacks are placed together, so that several are served from a common gangway, the more floor area is saved. As space continues to be saved in this manner so labour and fork truck costs are increased until the extreme opposite to the pallet rack is reached namely: the 'block-stack'. A block stack could consist of several hundreds of pallets stacked in a single solid block all served by one common gangway only (Fig. 4).

Depending on the amount of stock to be carried at any given moment in a certain area, the stacking pattern can be made to vary in numerous combinations lying between the two extremes of the pallet rack and the block stack (Fig. 5). For instance in industries subject to large seasonal fluctuations, at a low activity season the store may consist partly of material in pallet racks and partly of rows of single stacks placed back to back, each single row with its own service gangway. As stock increases some rows can become double rows on a gangway until the peak activity season is reached when all rows might be deep blocks on to each gangway (Fig. 6).

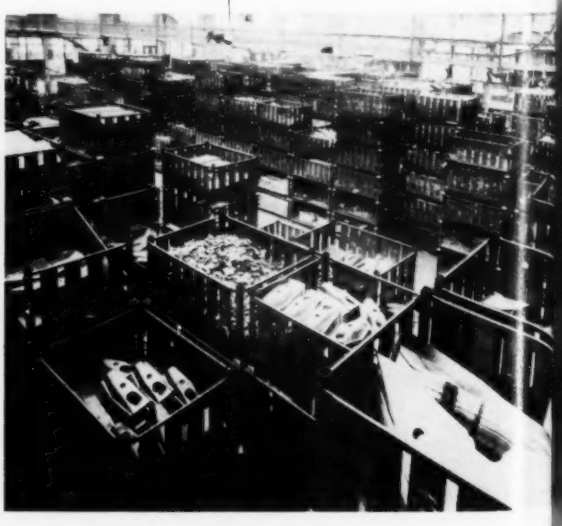
It is this flexibility which is one of the great advantages of this modern method of materials handling. Short term situations can be dealt with rapidly and at little extra cost. The alternative under older methods would be to seek and acquire temporary extra warehouse space, bringing in its train considerable extra expense in labour, rent, transport, etc. Another method sometimes encountered is to have a warehouse large enough to take the peak load and which is only partly filled for most of the year.

These methods and alternative warehouse stacking patterns and the cost factors involved have been discussed by the author in a previous article entitled 'Palletized Storage—Economic considerations' and which was published in *Mechanical Handling* in September 1957.

The fork lift truck and pallet system, their application in stores and warehouses and the variety of ways in which pallets can be stacked are now widely understood and appreciated in industry. What is perhaps not so widely known is that there are other modern methods of storing materials which offer this high degree of flexibility. In this instance we are again faced with the compromise between cost of space and cost of labour. Let us take as an example the storage and handling of small components by means of the tote box system. This method first came into popular use in this country some ten years ago and has since spread rapidly to many industries producing diverse commodities. It has been described in an illustrated article by the present writer, published in *Mechanical Handling*, November 1953, entitled 'A new method of handling and storing small components'.

Fundamentally the system is based on a metal tote box or work box 12 × 12 × 6 in which will hold components up to a quantity which can be manually handled by the average male or female operator (Fig. 7). Materials can be delivered in them direct from supplier to user, stored by the user in special racks or pallets and issued to a process operation or assembly operation without individual parts being handled. The system enables parts to be handled without the need for them to be continually counted at each stage and eliminates damage to delicate parts. Parts can be stored with less loss of space than in the conventional bins. The oldest materials can be issued first and stock checking is considerably simplified.

Fig. 4. View of a store equipped with box pallets placed in 'block stack formation'. (Courtesy of Fisher & Ludlow, Ltd.)



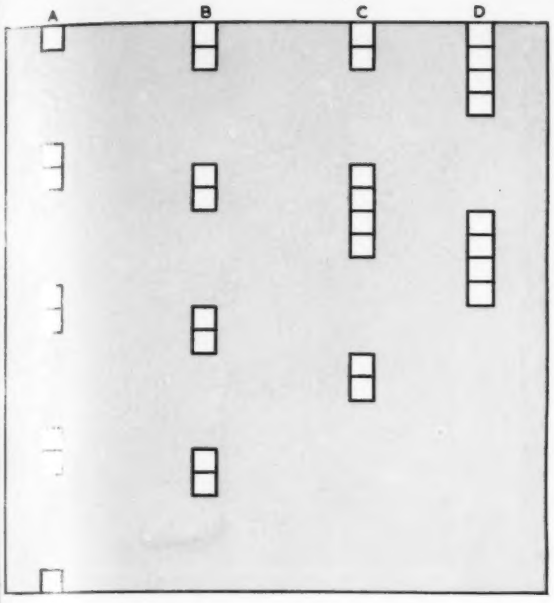


Fig. 5. Pallet stacking patterns for a given quantity of pallets. 3 ft × 3 ft pallets and pallet racks with 12-ft gangways. Height of stacks is dependent on available height in the buildings. Number of adjacent stacks or length of pallet racks is dependent on size of store
A. *Pallet racks: eight rows of racks—four gangways. Minimum labour and fork lift trucks. Maximum floor space*
B. *Pallet stacks and pallet racks: two double stacks—four pallet racks —three gangways*
C. *Pallet stacks: four double stacks—two gangways*
D. *Block stacks of pallets: two quadruple stacks—one gangway. Maximum labour and fork lift trucks. Minimum floor space*

Fig. 7. Examples of types and sizes of components which can be handled and stored in a tote box 12 × 12 × 6 in. (Courtesy of Lockheed Hydraulic Brake Co., Ltd.)

Some years of experience in the operation of this system, however, has brought further developments and three alternative methods of handling tote boxes are used where certain conditions apply.

The three methods are as follows:—

1. Storage in special racks. A rack occupies 9 sq. ft. of floor space and has a capacity of 120 boxes. It is built up of three sections; each section holding four boxes in width, two in depth and five in height (Fig. 8).
2. Storage direct on the floor in stacks of 10 tote boxes high (Fig. 9).
3. Storage in a simple post pallet to take 30 tote boxes. Five layers of boxes each 3 ft wide by 2 boxes in depth. Floor space occupied by pallet is 10 sq. ft. (Fig. 10).

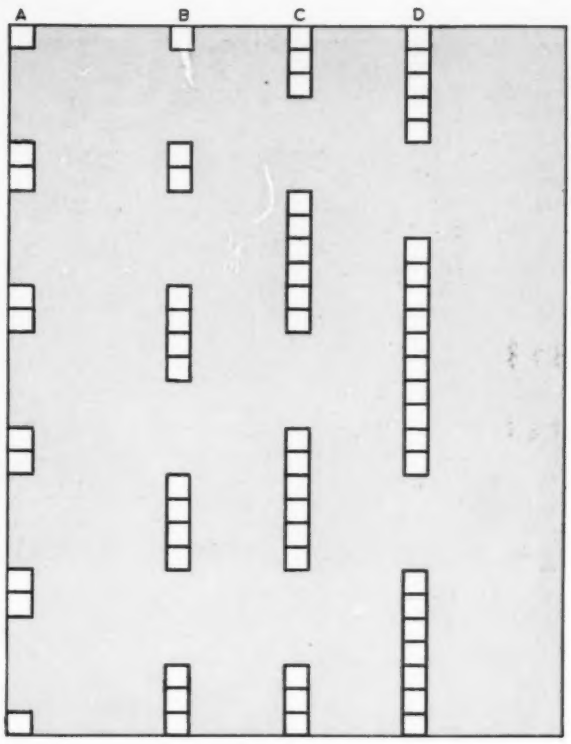


Fig. 6. Varying utilization of a given stores area. 3 ft × 3 ft pallets and pallet racks with 12-ft gangways. Height of stacks is dependent on available height of building. Number of adjacent stacks or length of pallet racks is dependent on size of store
A. *Pallet racks: 10 rows of racks, five gangways. Occupancy 33·3 per cent*
B. *Pallet racks and pallet stacks: three rows of pallet racks, four double and one treble rows of pallet stacks, four gangways. Occupancy 46·6 per cent*
C. *Pallet stacks: six treble rows of pallet stacks, three gangways. Occupancy 60 per cent*
D. *Pallet blocks: three blocks of pallets five deep and one block of pallets seven deep, two gangways. Occupancy 73·3 per cent*

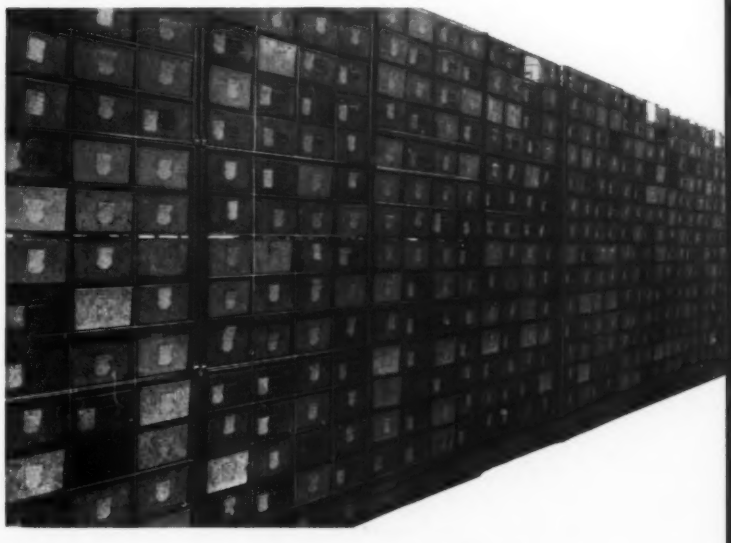


Fig. 8. View of a store equipped with tote box racks made up of three separate sections of tiers of five boxes, each rack holding 120 boxes (i.e. 60 × 2 in depth). (Courtesy of Victrolec, Ltd., and Lockheed Hydraulic Brake Co., Ltd.)

Fig. 9. Tote boxes 12 × 12 × 6 in stored in stacks of 10 directly on the floor. (Courtesy of Lockheed Hydraulic Brake Co., Ltd.)

Fig. 10. Tote boxes 12 × 12 × 6 in stored in post pallets containing 30 each. (Courtesy of Lockheed Hydraulic Brake Co., Ltd.)

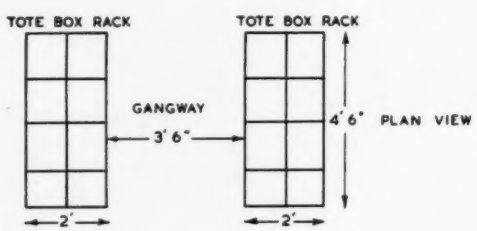
Before examining each method separately and studying the conditions under which each should be used, certain basic information is required to make the necessary calculations to show the economic considerations and factors applicable to each method. It must be emphasised at this stage that the figures and costs shown are examples quoted purely for the purposes of explanation. A reader wishing to apply the principles must when making his investigations substitute those figures which apply to his own circumstances.

1. An average storage period of four weeks is assumed.
2. A building cost per square foot of 3·16d. for four weeks is assumed.
3. Cost of a tote box 12 × 12 × 6 in for four weeks and depreciated over five years is 1·2d.
4. Cost of a tote box rack for four weeks and depreciated over 10 years is 41d.
5. Cost of a post pallet for four weeks and depreciated over 10 years is 8·3d.

The three storage methods will now be examined in turn and for purposes of comparison each cost will be expressed in terms of a single tote box. The details given will indicate the conditions under which each system should be operated to give optimum efficiency.

Method 1

A store is equipped with tote box racks and is laid out with 3 ft 6 in gangways between racks. Each rack is 4 ft 6 in × 2 ft. The gangway is adequate to allow operators to pass using a small hand truck or a light aluminium ladder to reach the higher tiers of boxes. Each rack contains 15 tiers of eight boxes.



Equipment Costs

Cost per tote box:

Tote box 12 × 12 × 6 in	= 1·2d.
Tote box rack $\frac{41}{120}$	= 0·34d.
	1·54d.

Space Costs

Cost per tote box:

$$\frac{\text{Total area (two racks plus gangway)} \times \text{cost per square foot}}{\text{Total number of tote boxes in two racks}}$$

$$\left\{\frac{(4{\cdot}5 \text{ ft} \times 2) \times 2 + (3{\cdot}5 \text{ ft} \times 4{\cdot}5 \text{ ft})}{240}\right\} \times 3{\cdot}16 = 0{\cdot}44\text{d.}$$

Note: The tote boxes bear the cost of the total area including the gangway. If the layout provided only for one row of racks, the cost of floor area would be much higher.

Handling Costs

The issuing and receiving functions are performed manually and include all work such as checking, making out stores documents, etc., appertaining to these functions which a storeman has to perform. Average times are taken over a long period. A piecework scheme operates.

Receiving per tote box	4·1d.
Issuing per tote box	0·99d.
	5·09d.

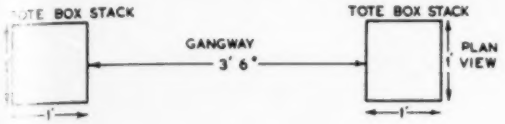
Total Costs per tote box for four weeks

Equipment	:	1·54d.
Space	:	0·44d.
Labour	:	5·09d.
		7·07d.

Method 2

Where larger quantities of tote boxes containing the same part number are received and issued it has been found

practicable to stack 10 tote boxes upon one another on the floor and to handle such a stack with a sack truck. A 3 ft 6 in gangway is left between rows of stacks.



Equipment Costs

Cost per tote box:

Tote box 12 × 12 × 6 in = 1·2d.

Space Costs

Cost per tote box:

$$\frac{\text{Total area (two stacks plus gangway)} \times \text{cost per square foot}}{\text{Total number of tote boxes in two stacks}}$$

$$\left\{\frac{(1 \cdot 1)\ 2 + (3{\cdot}5 \times 1)}{20}\right\} \times 3{\cdot}16 = 0{\cdot}81\text{d.}$$

Note: The tote boxes bear the cost of the total area including the gangway. If the layout provided only for one row of stacks of boxes, the cost of floor area would be much higher.

Handling Costs

The same remarks apply as under Method 1—

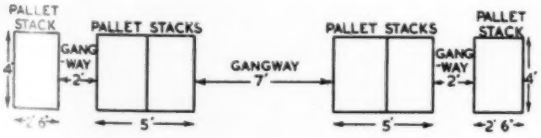
Receiving per tote box = 1·98d.
Issuing per tote box = 0·33d.
2·31d.

Total cost per tote box for four weeks

Equipment	:	1·2d.
Space	:	0·81d.
Labour	:	2·31d.
		4·32d.

Method 3

Where larger quantities still of tote boxes containing the same part number are received and issued it has been found convenient to make use of a simple inexpensive steel post pallet to contain 30 tote boxes. These pallets are handled by a fork lift truck in the stores and are stacked four high.



Two at a time can be moved in and out of the stacks and a storeman with a hand truck can manœuvre a full post pallet at the machine tool or process station. With this method flexibility exists to stack in depth. Three rows of pallets are stacked either side of a 7-ft gangway. A 2-ft gangway is left between the second and third rows so that manually small quantities can be issued from the lower pallets.

A piecework scheme operates.

Equipment Costs

Cost per tote box:

Tote box 12 × 12 × 6 in = 1·2d.

Post pallet for 30 boxes = $\frac{8{\cdot}3\text{d.}}{30}$ = 0·28d.

1·48d.

Space Costs

Cost per tote box:

$$\frac{\text{Total area (six post pallets plus gangways)} \times \text{cost per sq. ft.}}{\text{Total number of tote boxes in 24 pallets}}$$

$$\left\{\frac{(4 \times 2{\cdot}5 \times 6) + (7 \times 4) + (2 \times 4 \times 2)}{720}\right\} \times 3{\cdot}16 =$$

$$\frac{(60 + 28 + 16) \times 3{\cdot}16}{720} = 0{\cdot}46\text{d.}$$

Handling Costs

The handling is performed mainly by fork lift truck with a small amount of manual work on small quantities from the bottom pallets in the stacks. A piecework scheme operates.

These costs include the running cost of the fork lift truck incorporating, power, maintenance labour, spares, depreciation and overheads.

Receiving per tote box = 1·77d.
Issuing per tote box = 0·66d.
2·43d.

Total cost per tote box for four weeks

Equipment	:	1·48d.
Space	:	0·46d.
Labour	:	2.43d.
		4·37d.

Summary

	Method 1	Method 2	Method 3
Equipment	1·54d.	1·2d.	1·48d.
Space	0·44d.	0·81d.	0·46d.
Labour	5·09d.	2·31d.	2·43d.
	7·07d.	4·32d.	4·37d.

These three methods can all be used at one and the same time in the same store. Two examples from practice illustrate how this works and the cost involved.

Example 1

If a batch of 11 tote boxes containing the same part number is received in the store they would be dealt with by placing 10 in a stack on the floor (Method 2) and locating one in a tote box rack (Method 1).

Cost: (10 × 4·32) + (1 × 7·07) = 50·27d.

If all boxes had been placed in racks the cost would have been 11 × 7·07 = 77·77d. which is 54 per cent higher.

Example 2

If a batch of 64 tote boxes is received in the stores all containing the same part number they would be dealt with by placing 30 in each of two pallets (Method 3) and the remaining four located in a tote box rack (Method 1).

Cost: (60 × 4·37) + (4 × 7·07) = 290·48d.

If all boxes had been placed in tote box racks the cost would have been $64 \times 7{\cdot}07 = 452{\cdot}48$d. which is 55 per cent higher.

If on the other hand 60 had been placed in stacks of 10 (Method 3) and four in tote box racks the cost would have been $(60 \times 4{\cdot}32\text{d.}) + (4 \times 7{\cdot}07\text{d.}) = 287{\cdot}48$d.

It will be noticed that Method 2 and Method 3 are almost identical from a cost point of view only, but no doubt in practice Method 3 would have been chosen for this receipt of 64 tote boxes into the store because it would occupy considerably less space, approximately 48 per cent.

A slightly higher capital outlay is required to establish Method 3, but under most conditions this would be preferable and more practicable than using or acquiring additional floor area.

Conclusion

It will be seen from these case studies and examples that considerable flexibility exists with modern storage methods thus giving management an opportunity to meet changing conditions, such as an increase or decrease in stockholding within a given area, to create additional productive area without the need to build or acquire additional premises, etc.

There are three main factors to be calculated before deciding on a course of action.

(*a*) cost of equipment.
(*b*) cost of space.
(*c*) cost of labour.

The case studies and examples bear out the statement made at the commencement of this article that there is a continual compromise in this type of work between the cost of labour on the one hand and the cost of space and the capital investment in equipment on the other.

Finally it is emphasized that the examples given, although quoted from practical experience, are not intended for general application but are given to serve as examples to prove the points made and to stimulate further thinking in the aspect of materials handling costing as applied to stores and warehouses.

MOBILE LOADERS AT POOLE GAS WORKS

THE SPECIAL REQUIREMENTS of the Gas Industry for loading vehicles have been studied specifically in the design of the Bray Loader BL 32, made by Bray Construction Equipment, Ltd., Feltham, Middlesex. Some of these machines are employed by the Southern Gas Board at Poole Gas Works, Dorset, for the speedy and economical handling of coke.

The prime feature of the BL 32 is the purpose-built, 2-cu. yd. capacity bucket, though the longer reach of the machine is valuable in the loading of high wagons, as is shown in the accompanying illustrations.

The bucket is so designed as to ensure a clean floor between the wheels of the loader, with no coke crushed on the ground. It has a rear hood which enables a heaped load to be carried without spillage. Special seals are fitted to the crowd jacks on the boom; as the ram extends, it is covered with a thin film of oil which protects it from abrasive materials and corrosion. As the ram retracts, the seal wipes off the film, together with foreign bodies.

Two Bray BL 32 loaders are seen loading a high wagon at Poole Gas Works

Another view of a Bray Loader BL 32 at Poole Gas Works

At the Poole works, the BL 32 handles over 1,600 lb of coke on each run; the manœuvrability and ease of operation enable the drivers to keep up this rate of loading for long periods without strain. One machine moves 22 cu. yd. of coke from stockpile to truck in 8 min—which proves that Poole's annual coke handling figure of 93,000 tons is not so fantastic as it first seems.

During the winter, which is of course the busy season for the coke side of the gas industry, up to 50 lorries may come in for loading each day—many of them having a 22 cu. yd. capacity. Besides the lorries, there are always railway wagons to be filled. An important aspect of yard work at Poole is the proximity of the sea—from which the hardiest breezes blow even on the best summer day. This means that the unprotected worker may have an unpleasant time of it and the covered cab of the BL 32 is fully appreciated.

Mr. N. W. Hullah, works superintendent at Poole, informs us that the Bray loaders perform other duties at the plant, including the moving of spent oxide—though coke handling is their prime duty. Altogether, the Poole establishment has five Bray loaders on its strength.

PLANT AND EQUIPMENT FOR PUBLIC WORKS AND CIVIL ENGINEERING CONTRACTORS

Part I of a review by our own reporters of new mechanical handling machines and storage plant introduced at the Public Works and Municipal Services Exhibition

As on previous occasions, pride of place at this year's Public Works and Municipal Services Exhibition was held by the impressive earth-moving machines—crawler and wheeled tractors, and tractor-based scrapers, dozers, excavators, and loaders.

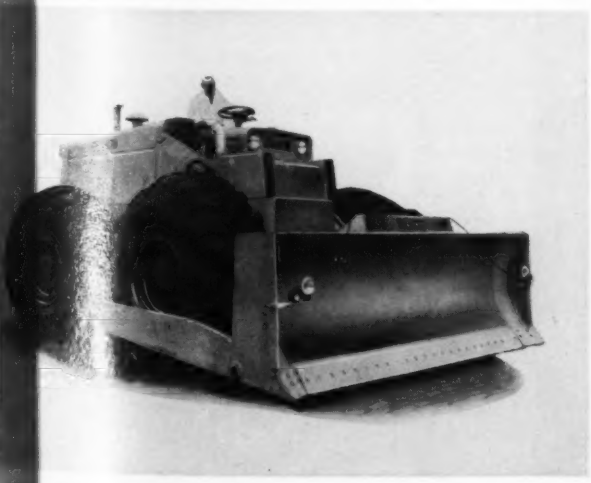
This year the giants were bigger than ever. Powered by engines developing 150-350 b.h.p. and over, and equipped with clutchless transmissions over a wide speed-range, they are capable of handling material at rates, in terms of tons an hour, that would until recently have seemed outside the scale of any operations likely to be conducted in the British Isles.

The Big Tractors

A Cummins NHS 290-b.h.p. diesel engine is fitted to both the tractor and the scraper portions of the Euclid TS-24 24-yd scraper exhibited jointly by the manufacturers, **Euclid (Great Britain), Ltd.,** Motherwell, and **John Blackwood Hodge & Co., Ltd.,** London, the distributors. The bowl has a heaped capacity of 32 cu. yd. Both power units drive a full-floating axle, with single-reduction carrier and planetary reduction in each wheel, through an Allison gearbox and torque converter, giving four forward and two reverse speeds. The brakes of both axles are air-pressure-operated and the steering is controlled by two hydraulic jacks. A positive roll-out type of ejector is actuated by a three-stage single-acting hydraulic jack, and all scraper operations and the bowl apron are hydraulically and independently controlled.

TS24 Euclid scraper, powered by two 290-b.h.p. Cummins engines, was a giant among the giants, with a heaped capacity of 32 cu. yd.

Michigan's massive 380 tractor-dozer, with 375-b.h.p. turbocharged engine driving through torque converter to two or four wheels



The new Model C-6 Euclid crawler has a 218-h.p. Cummins diesel engine, driving through an Allison torque converter and semi-automatic transmission, giving three forward and three reverse speeds. All forward and reverse speed changes are made under full power as there is no clutch, thus giving the tractor excellent manœuvrability. Final reduction is through planetary gear in the track sprocket hubs. Steering is by an Allison power-operated, oil-cooled multiple-disc clutch, and the brakes are of the Allison multiple-disc oil-cooled type. With overall length of 14 ft 10 in, width of 8 ft 4 in, standard tracks 22 in wide, and operating weight of 41,000 lb, the tractor has a top speed of 8 m.p.h. Available attachments are bulldozer and angledozer blades, push plate, double-drum cable, and hydraulic control units and hydraulic ripper.

Another giant machine, the biggest of its kind obtainable in Great Britain, is the 380 tractor-dozer, shown by **Michigan (Great Britain), Ltd.,** London, which was taken out of service on sites in the Midlands for the duration of the exhibition. Power from a Cummins 375-b.h.p. turboblown diesel engine is transmitted via a Clark 3:1 torque converter

and power-shift-operated gearbox providing four speeds forward and four reverse, with selector for two-wheel or four-wheel drive. Running on 20-ply 33·5×33 tyres, the 380 has a top speed of 25 m.p.h. in either direction. Front-end equipment includes a 14-ft blade with built-in pusher attachment for heavy duties and a 20-ft blade for handling coal and other lighter materials.

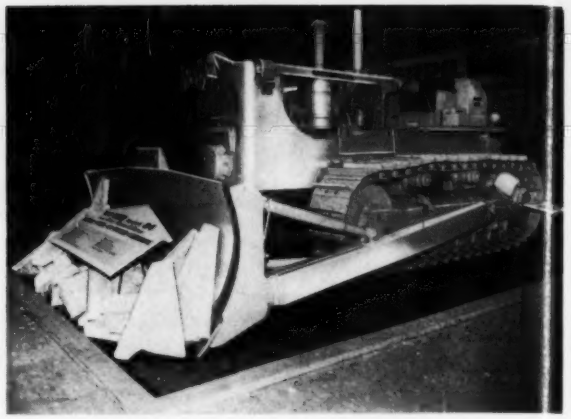
Featured as the principal exhibit by the **Caterpillar Tractor Co., Ltd.**, Glasgow, a demonstration of whose equipment was reported on pages 792-798 of the December, 1958, issue of *Mechanical Handling*, was the D8 crawler-tractor now in production at the Scottish factory. Powered by a 225-h.p. turbocharged diesel engine, this tractor provides six speeds in both the forward and reverse directions, weighs 46,734 lb, and has a ground-clearance of $19\frac{7}{8}$ in. The exhibition model was equipped with Caterpillar No. 8S bulldozer and No. 30 cable control, and a D8D towing winch from the Hyster company's British factory.

Alongside the D8 was a 128-h.p. D7 crawler-tractor, now available on the British market as a result of the recent trade agreement, which was fitted with a No. 7A angling-type hydraulically controlled dozer.

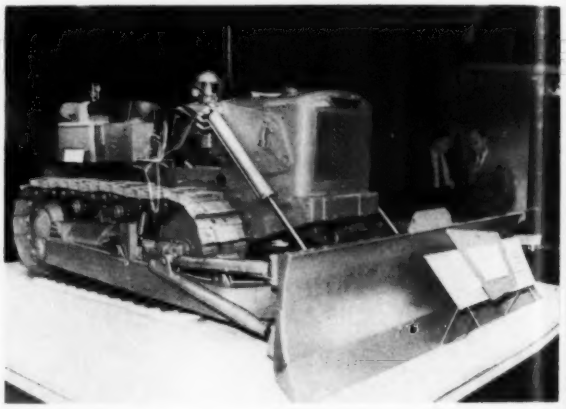
Wheeled Caterpillar machines were represented by a DW21 tractor coupled to a No. 470 lowbowl scraper. Powered by a 320-h.p. turbocharged engine, giving a rim-pull of 43,710 lb, the unit provides a struck capacity of 18 cu. yd. and can travel at speeds of up to nearly 30 m.p.h.

Two new Allis-Chalmers crawler-tractors were introduced by **Mackay Industrial Equipments, Ltd.**, Feltham. Both are built on unit-construction chassis, allowing any component of the power train to be removed and replaced without disturbing adjacent parts, and are powered by Allis-Chalmers diesel engines with the dual-chamber 'energy cell' that enables maximum pressures to be developed at the most favourable crankshaft angles.

In the larger of the two machines, the HD16, the power unit develops 150 h.p., and the drive is transmitted either through a torque converter or by constant-mesh helical gears providing six speeds forward and three reverse. The



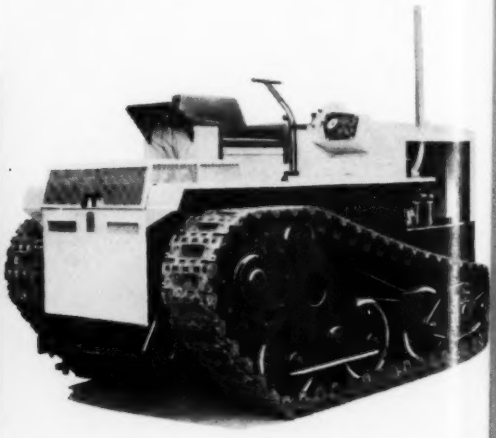
D8 crawler-tractor from Caterpillar's Glasgow factory, equipped with Caterpillar 8S dozer and No. 30 cable control, and Hyster D8D towing winch



ABOVE
Fowler 'Challenger' 33 fitted with four-position angledozer and TM33 cable control

LEFT
This Allis-Chalmers HD16 crawler-tractor develops a drawbar pull of 37,700 lb with standard transmission, and 60,000 lb when fitted with torque converter

BELOW
Hydrostatic transmission is embodied in this Bagnall-Burns tractor powered by Meadows 90-b.h.p. diesel engine. Control panel seen mounted on prototype is for test purposes only



tractor weighs 31,600 lb and develops a drawbar pull of 37,700 lb with the standard transmission, or 60,000 lb with the torque converter. It was shown equipped with a cable-operated angledozer and Onions cable control unit.

The second newcomer is the HD11B, fitted with a 99-h.p. engine producing 77 b.h.p. and six forward ratios and three reverse in a constant-mesh gearbox.

A new addition to the 'Challenger' range of crawler-tractors was shown by **Marshall Sons & Co., Ltd.**, Gainsborough, and **John Fowler & Co. (Leeds), Ltd.**, the manufacturers. Designated the 'Challenger' 33, the machine is powered by a Leyland 680 diesel engine, developing 125 b.h.p., and gives a maximum drawbar pull of 28,500 lb. The gearbox provides six forward ratios and four reverse, with a top speed of 6·22 m.p.h.

Unit construction is employed throughout. Final-drive units are flange-mounted to the massive box-section main frame and can be removed without disturbing the track frames. These are held in parallel alignment by a cranked front cross-beam functioning as a shock-absorbing torsion bar. Main operating shocks are taken by a massive rear suspension beam, which is independent of the track frames and sprocket shaft.

Matched equipment, fabricated within the Marshall organization, is available for use with all machines in the Fowler 'Challenger' series. The '33' was equipped at the exhibition with a four-position hydraulic angledozer and a TM 33 cable control unit capable of handling scrapers of 10-14 cu. yd. capacity.

Six gearbox ratios in both the forward and reverse directions, providing maximum speeds of 7 m.p.h. forward and 8·4 m.p.h. reverse, are available in the new B.T.D.20 crawler-tractor shown by **International Harvester Co. of Great Britain, Ltd.**, London. A maximum drawbar pull of 25,440 lb is obtained at the governed speed of the 124-h.p. Rolls-Royce diesel engine, which delivers a calculated belt horsepower of 117.

Gears are selected by two levers; one for speed changes and the other for forward-reverse directions. Steering clutches are hydraulically assisted; steering brakes are full-wrapping and self-energizing.

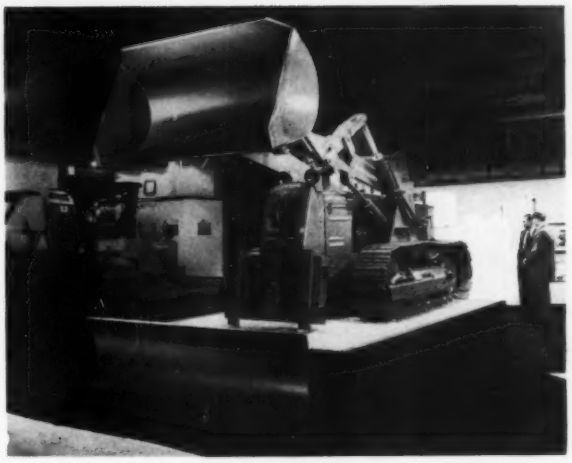
Tractor with Hydrostatic Transmission

Of outstanding interest was a crawler-tractor with hydrostatic transmission introduced as a prototype of **W. G. Bagnall, Ltd.**, Stafford. Incorporating the name of its inventor, it is designated the Bagnall-Burns B.B.90.

Powered by a Meadows 4DC420 diesel engine of 90 b.h.p., the machine weighs 8 tons and has a rated drawbar pull of 15,000 lb. In addition to its unusual transmission system it has an original form of track suspension and an unconventional seating arrangement, with the driver facing sideways. It also provides for a simplified method of mounting attachments, which are supported by a cross-beam and brackets incorporated in the main frame.

The drive to the track sprockets is transmitted by two seven-cylinder radial hydraulic motors operating on fluid delivered at a pressure of 3,000 lb/sq. in. (max.) by two reversible-flow pumps. Stepless speeds of 0-7 m.p.h. in either direction are obtained by regulating the infinitely variable rate of delivery of the pumps. Thus all steering and travel motions are controlled by two hand levers. Among the obvious gains are greater ease of operation, a reduction in the number of parts and controls resulting, on both counts, in a reduction in maintenance costs.

The effect of the improved suspension system is to maintain uniform tension in the tracks, regardless of the state of the ground. Each track is carried by a group of independent articulated bogies and idler, which enable the upper run of the track to provide compensating adjustment for variations in the tension of the lower run. Thus the track is always in intimate contact with the ground and adhesion and tractive effort are maintained at maximum level. If required, the suspension can be made rigid by the insertion of a locking bar.



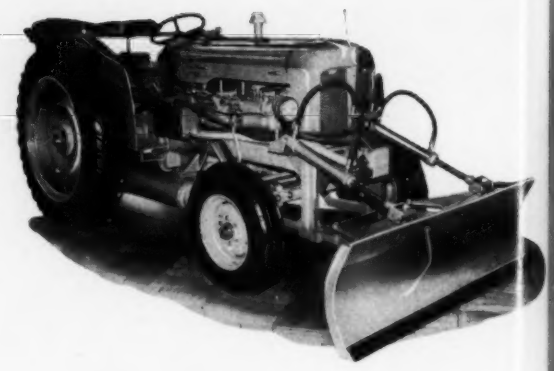
Dozer blades, and other alternative attachments, can be operated by the new David Brown 50 TD crawler tractor shown mounting a front-end shovel

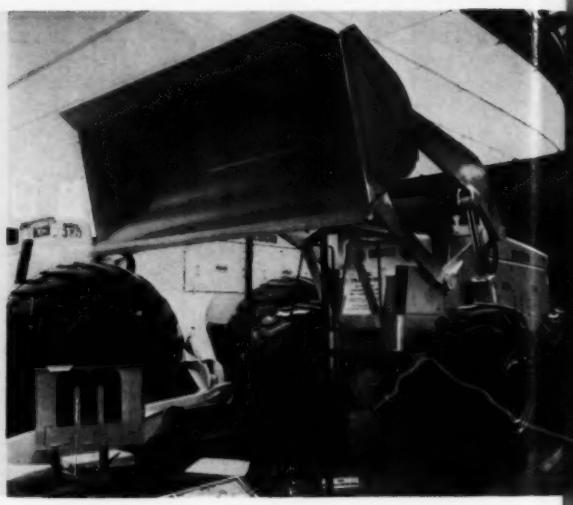
Industrial Tractors

A new production of **David Brown Construction Equipment, Ltd.**, Feltham, is the 50 TD crawler-tractor with front-end shovel. The standard bucket of 1 cu. yd. struck capacity, or 1½ cu. yd. heaped, is 6 ft wide and fabricated from 'Cor-Ten' steel to give extra strength and long life. The twin members of the boom are raised and lowered by a pair of double-acting hydraulic rams, and the bucket is controlled by two rams acting through pivoted levers. The tractor is powered by a 6-cylinder direct-injection diesel engine of 50 h.p., driving through a six-forward and two-reverse speed gearbox. Alternative equipment includes angledozer and bulldozer blades, fork lift attachment, logging clamp, ¾-cu. yd. heavy-duty bucket, alloy bucket teeth, scarifier teeth and rear-mounted ripper.

A feature of the new David Brown 4-yd hydraulic scraper is the downward pressure exerted on the cutting edge of the three-piece blade by a pair of vertical rams mounted at the forward end. Of wear-resisting alloy steel, the reversible blade is 6 ft wide, with centre section 3 ft in width, and has a depth of cut of 9 in. A single ram at the rear moves the

International Harvester's new 35-h.p. industrial tractor with eight-speed gearbox





ABOVE RIGHT

This Leeford twin-jack 'Muledozer' was one of many 'Fordson Major' based equipments seen at the show

ABOVE

The forward reach, discharge height, and driver positions of the Chaseside 'Loadmaster' 3000 facilitate lorry-loading operations

RIGHT

Clark torque converter and power shift transmission, four-wheel air-operated brakes, and hydraulic steering, assist the driver of this 262-h.p. turbocharged Michigan tractor-shovel, the biggest British-built machine of its type

ejector forward to discharge the load, and a horizontal ram at the front operates a cable-and-sheaves system for lifting the apron. The four wheels, which are interchangeable, front and rear, have tapered roller bearing hubs and are fitted with 11.00 × 20 tyres.

A full report on the new range of David Brown tractors and matched equipment will be published in a future issue.

Making its first public appearance on the stand of **International Harvester Company of Great Britain, Ltd.**, was the industrial version of the B-275, the new wheeled tractor from the company's Bradford works. Principal features of this 35-h.p. machine are the close forward ratios available from the eight-speed forward, two-speed reverse, gearbox and the constant-running power-take-off, which allows the tractor to be brought to a standstill without interrupting the operation of attachments or trailer-mounted equipment driven off the tractor engine.

Other newcomers to the Public Works Exhibition were the Massey-Ferguson 65 and the 'Fordson Dexta', both of which were shown at the Mechanical Handling Exhibition and are mentioned in the review of the exhibition in our June, 1958, issue. Disc brakes and power-assisted steering are among the features of the new 50·5-h.p. wheeled tractor shown by **Massey-Ferguson (Great Britain), Ltd.** The 'Dexta', which was introduced by the **Ford Motor Co., Ltd.**, Dagenham, as a 'workmate' to the 40·5-h.p. 'Fordson Major', is powered by a three-cylinder diesel engine developing 32 b.h.p. at 2,000 r.p.m., and has a six-speed-forward, two-reverse, gearbox and simplified hydraulic system with single-quadrant control.

Graders and Finishers

Among the several new products exhibited by **Blaw Knox, Ltd.**, London, were a four-wheel-drive grader and a paver-finisher. Incorporating many of the features of the PF-90 paver-finisher, the new PF-45 is a smaller machine, powered by a Ford 592E four-cylinder diesel engine developing 58 b.h.p. at 2,100 m.p.h. It is designed to lay any width of pavement between 7 ft and 11 ft and to handle hot or cold material, to any specification, in any thickness up to 8 in. Travelling speed is 10·02 m.p.h. and working speed is variable between 4½ ft/min and 62 ft/min.

Cuts of 13 in depth and 42 in width, with 11 in lift above ground-level, can be made by the BK10 grader. Power from a Leyland AU-350 105-b.h.p. diesel engine is transmitted to the front and rear axles through a six-speed gearbox, giving a maximum of 20 m.p.h. forward, with two additional reverse ratios. A dogging clutch provides engagement of the final reduction gears in the front wheel hubs via a transfer box and differential box mounted on the front axle, and thus allows a two-wheel or four-wheel drive to be selected at will. Hydraulic power-assisted steering and side-shift are optional extras.

Two new six-wheel graders were exhibited by Aveling

ABOVE

With independent crowd and 360-deg slew, the NCK 205 'Skooper' can dig and load without moving its tracks

TOP RIGHT

Breakout force exerted by this 6/90 version of the 'Matbro Mastiff' is 17,000 lb. Four-wheel torque-converter drive and central-pivot steering provide exceptional manœuvrability

RIGHT

Powered by 110-b.h.p. Leyland engine, Bray's new BL460T tractor-shovel is fitted with torque converter and hydraulically operated gearbox

Barford, Ltd., Grantham. The Super MG, said to be the first in this country to be six-wheel-driven, has a Dorman or Leyland 100-h.p. diesel engine, and a torque converter is an optional extra. The rear tandem bogey, with 15-deg steering movement in each direction, has double-reduction gearing and a final drive by chain to the wheel hubs. The centre-pivoted front axle has 25-deg steering movement each way and is driven by double-reduction gearing. The hydraulically controlled blade is 12 ft long, cuts 19 in below ground-level and lifts 12½ in above ground-level. It has a side-shift of 80 in by power and 11 in is added manually. Blade-pitch adjustment has seven positions through a 23-deg arc.

The LG grader has tandem drive and inclined front wheels to counter the side-thrust caused by the load on the blade. Either a Dorman 72-b.h.p. or a Perkins 62·5-b.h.p. diesel engine can be fitted, with a four-speed gearbox and double-reduction-geared back axle. The 10-ft blade cuts 14 in deep, is raised 15 in, and has a total side-shift of 60 in, with manual or optional hydraulic operation. Tilt adjustment has eight positions through an arc of 23 deg.

Tractor-Shovels

Largest of the tractor-shovels was the new 275A on the stand of **Michigan (Great Britain), Ltd.,** London. Powered by a 262-h.p. Cummins turbocharged diesel engine, and providing a loading capacity of 22,000 lb, this is the biggest British-built machine of its type. It is available with a 4-cu. yd. bucket for heavy duty or with buckets of up to 8-cu. yd. capacity for light materials. Clark torque-converter and power-shift transmission, providing four speeds forward and four reverse, with a maximum of 28 m.p.h., are standard equipment. The four-wheel brakes are air-operated and the steering is hydraulically assisted.

Also from their U.K. production is the 9,000-lb 85A, another new wheeled tractor-shovel in the now extensive Michigan range. Optional bucket sizes from 1¾ cu. yd. to 2½ cu. yd. are available for this model, which is powered by a Leyland diesel engine developing 92 b.h.p. at 2,200 r.p.m.

The main features of the new Loadmaster 3000 power shovel exhibited by the **Chaseside Engineering Co., Ltd.,** Hertford, are a six-cylinder 148-b.h.p. diesel engine; four-wheel drive through an Allison single-stage torque converter, three-speed each-way epicyclic gearbox and transfer gear, in one assembly, and epicyclic hub reduction gear; Hydrovac-boosted hydraulic four-wheel brakes; hydraulically assisted steering; 16.00 × 24 pneumatic tyres; 6 in lift and crowd jacks; and heavy steel-plate scoop with manganese-steel replaceable toe-plate sections. The scoop and sidearm mechanism, using the front axle as the fulcrum, apply the full weight and hydraulic power of the machine to the toe-plate, and the sidearm linkage gives the scoop a 45-deg angle of crowd and a corresponding angle of tip

in the fully raised position. When lifted to the maximum discharge height of 10 ft 2 in, the scoop position is contained within a non-spill angle of 10 deg. The maximum lift force is 20,000 lb and breakout force 22,500 lb. Alternative engines with characteristics similar to those of the standard unit may be fitted if desired.

Extending the range of BL tractor-shovels was a new 2¼-cu. yd. model, the BL460T, a surprise exhibit on the stand of **Bray Construction Equipment, Ltd.,** Feltham. It is powered by a Leyland UE375 diesel engine developing 110 b.h.p, and fitted with a torque converter and Bray hydraulically operated three-speed gearbox and planetary drive-hubs, providing high and low travelling speeds with a maximum of 22·7 m.p.h. forward and 13 m.p.h. reverse. Breakout force is 17,000 lb.

Standard equipment includes hydraulic power-assisted steering, air-operated four-wheel brakes, and built-in power take-off. Main jacks and crowd jacks are double-acting and the static lifting capacity is 12,000 lb.

Independent crowding action and full-circle slewing enable the crawler-mounted NCK205 'Skooper' to dig, swing, and dump its load, while standing still on its tracks. The resultant gain in speed of operation enables the manufacturers to make and substantiate a claim that this machine, equipped with a 2⅛-cu. yd. bucket, will handle up to 350 tons of material an hour. A 1·7-cu. yd. rock bucket is available for work in quarries, and the machine can be converted for use as a face-shovel, dragshovel, dragline-excavator, or crane.

The new Merton 454 four-wheel-driven two-way loader

ABOVE

New 75 version of the JCB 'Loadall', with tearout force of 9,800 lb and bucket capacities from ⅜ cu. yd., for rock, to 1½ cu. yd. for loose material

LEFT

New FL4 Fiat 35-b.h.p. crawler-tractor with ¾-cu. yd. bucket and integral hydraulic ripper

BELOW

Front-wheel drive is a feature of the Weatherill 14H loading shovel shown engaged in snow clearance

Newton **Chambers & Co., Ltd.**, Sheffield, the makers and exhibitors of the 'Skooper' version of their NCK205, showed also their new NCK405 shovel. Basically, the 405 is a 15-ton crane, and a long, wide crawler frame is available to give a combination of stability and even load distribution, with a ground-pressure of less than 5½ lb/sq. in. The standard 40-ft lattice boom can be extended to a length of 90 ft. When equipped as a face-shovel, the NCK405 has a bucket-capacity of 1 cu. yd. It is, in addition, available with dragshovel and dragline attachments.

In the February issue of *Mechanical Handling* we shall be publishing a report of the performance of the 'Matbro Mastiff', a tractor-shovel of exceptional manœuvrability, with central-pivot steering operated by two hydraulic rams and four-wheel drive through torque converter and three-speed gearbox and double-reduction axles.

The most recent version of this machine, powered by a 96-h.p. Ford diesel engine, was introduced at the exhibition by Matbro **Brothers**, of Wallington, Surrey. The lifting capacity of this new 6/90 model is 11,000 lb, as compared with the 8,000-lb capacity of the 4/60, and the breakout force has been raised from 11,000 lb to 17,000 lb.

The 'Mastiff' has an outside turning radius of 150 in and a travelling speed in high top gear of 17 m.p.h. With a bucket roll-back angle of 51 deg, and discharge angle of 63·5 deg at the full discharge height of 9 ft, crowd and discharge times can be rated respectively at 1 sec and 1½ sec. Lifting time is 7 sec and lowering time 4 sec. When discharging at the maximum height of 9 ft, the outreach is 2 ft 5 in, and the maximum outreach of 6 ft 4 in, with horizontal bucket, is obtained at a lift height of 5 ft 7½ in.

On the stand of **Mackay Industrial Equipment, Ltd.**, Feltham, was a new Fiat crawler-tractor, the FL4, equipped with a ¾-cu. yd. bucket and an integrally constructed hydraulic ripper. At a maximum discharge height of 7 ft 4 in, the dumping reach of the 7-ft 4-in wide bucket, tilted at a discharge angle of 45 deg, is 3 ft 1 in. Maximum dumping angle is 68 deg. The ripper can work to a depth of 10 in and is fitted with three tynes, which can be adjusted to provide five working positions, or reversed when not in use.

Four forward and four reverse speeds are available, with maxima of 5·1 m.p.h. forward and 5·5 m.p.h. reverse. The Fiat diesel engine developing 35 b.h.p. at 2,200 r.p.m. incorporates a precombustion chamber and is equipped with a 24-V electric starter. The machine weighs 8,750 lb and has overall dimensions of 14 ft 1 in length by 4 ft 8¼ in width.

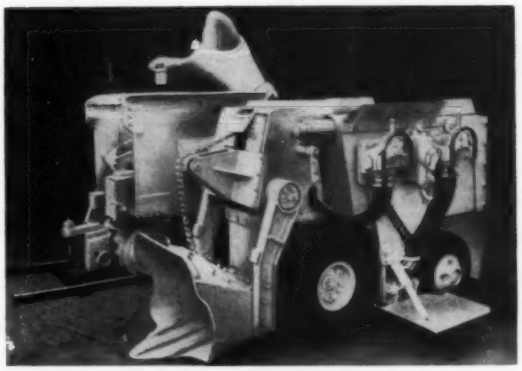
Features of special interest on the new 454 two-way loader shown by the **Merton Engineering Co., Ltd.**, Feltham, are four-wheel drive, fully controlled discharge at front and rear, an extra heavy-duty 13-in Borg & Beck clutch, power steering, and an elevated driving cab giving all-round vision. The power unit is a Fordson 54-b.h.p. diesel. The gearbox provides six forward and two reverse speeds and the front driving-steering axle has spiral-bevel primary reduction gear and final reduction by epicyclic gearing in the wheel hubs. A 'Hydreco' gear-type pump, driven from the front of the engine, provides hydraulic power for the double-acting main and bucket-tilting rams. Five alternative buckets are supplied, varying from ¾ cu. yd. to 2¼ cu. yd. capacity, in widths from 3 ft 6 in to 8 ft. Additional equipment includes bulldozer and angledozer blades and crane and fork lift attachments. Rear-wheel-driven and front-wheel-driven models are also available.

In their J.C.B. 'Loadall' 75 hydraulic loader, **J. C. Bamford (Excavators), Ltd.**, Rochester, employ the principal design features of the 'Loadall' 65 (announced on pages 640-641 of our September issue), including the large subframe serving as a 36-gal reservoir for hydraulic oil and the 9-in-deep front axle mounted on the subframe yoke, which relieves the power unit of operational stresses. Both machines are powered by a Fordson diesel engine, and equipped with power-assisted steering. Tearout force of the 75 is 9,800 lb. Buckets range from a rock bucket of ⅝ cu. yd. capacity to a 1½ cu. yd. bucket for loose material, and various other attachments are available.

In addition to the 75, a universal combination, comprising the rear-mounted 'Hydra-Digga' and front-mounted 'Loadall' 65, was shown for the first time at the exhibition. A full range of buckets and ditching attachments are available with this machine, which develops a breakout force of 20,000 lb. It has a loading height of 10 ft 8 in and maximum digging depth of 13 ft, and the ability to operate within a slewing angle of 180 deg, which means that spoil can be loaded or discharged well outside the excavation.

Features conducive to fast working commend the new 12H general-purpose loading shovel produced by **F. E. Weatherill, Ltd.**, Welwyn Garden City. Of simple design, it has a 12-ft discharge height and good forward reach, as required for loading high-sided lorries and high hoppers; a 40-deg scoop-crowd angle; a low scoop-carrying position, so that loads can be transported at maximum speed without spillage; a 33-per cent. increase in scoop breakway which, with improved scoop design and increased crowding angle, gives better initial penetration into the material; and all-round visibility for the driver. The machine is fitted with a 'Fordson Major' 44-b.h.p. diesel engine; six forward and two reverse speed gearbox; and a Vickers vane-type hydraulic pump driven from the crankshaft operating single-acting rams for the sidearms and double-acting rams for the scoop. Eleven sizes of scoop are available, ranging from ¾ cu. yd. to 2 cu. yd. Optional equipment includes a Brockhouse converter, power steering, and a variety of earth-moving attachments. A similar machine designed for soft-ground working has a wider front axle to accommodate larger wheels and tyres, and double-acting main rams to assist extrication of the machine out of especially soft spots. Also available is another version, known as the 14H model, with front-wheel drive, suitable for working over very soft ground.

The small Weatherill hydraulic S2 loader has been improved. It now has equal speeds forward and reverse, a smaller turning circle, and increased crowd for the scoop, which remains level at all heights, permitting a low carrying position.



Swedish Atlas Copco pneumatic-tyred T2G 'Auto-Loader' and LM56 rail-mounted shovel-loader

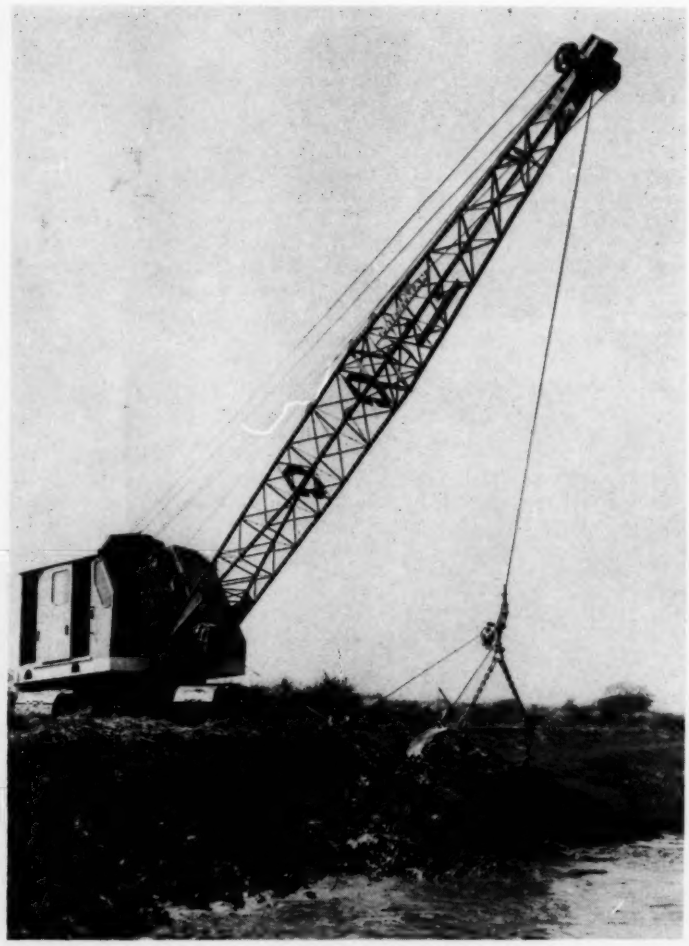
Rocker-shovels and Loaders

For mining, quarrying and similar operations the Swedish Atlas Copco T2G 'Auto-Loader' recently introduced by

Atlas Copco (Great Britain), Ltd., Wembley, combines the functions of a loader and dumper. It is mounted on four pneumatic-tyred wheels. The welded steel body is of 0·9 cu. yd. capacity and the bucket holds 4·25 cu. ft. Air-operated bucket and traction motors are of the vane type, and an auxiliary steering motor is also air-driven. When released by a catch, the bucket falls to the digging position and is raised by a chain against a buffer so that its contents are discharged into the body. The body rests on four grooved wheels. Upon release of a pedal-actuated ratchet and movement of the air-control lever, it is moved outwards and downwards by a pneumatic ram so that it tilts to discharge the load through the rear end which is automatically raised by a lever.

Also new to this country is the Atlas Copco LM56 shovel-loader, which has flanged wheels to run on rails. A 7-cu. ft. bucket is carried by a pair of arc-shaped rocker-arms in a swivelling cradle. It falls by gravity to the digging position and is raised by air motor and single chain until checked by two coil springs to discharge the load at a bucket height of 47 in. Steel cables anchored to the frame and to the rocker arms retain the latter while permitting their movement. Vane-type air motors are used for traction, swivelling the cradle, and raising the bucket. On both machines all the air controls are on one side above a folding platform on which the operator stands.

New Priestman 'Tiger' V-XLT crawler-excavator engaged in dragline operations for cleaning and widening the River Hull, East Yorkshire



Entirely independent hydraulic operation is a feature of the Skyhi A7 loader shown mounted on a 'Fordson Power Major' tractor

Another air-operated rocker-shovel, in this case track-mounted, was shown by **Eimco (Great Britain), Ltd.,** Gateshead. Maximum overall dimensions of this 622 model are 8 ft 9 in length, with bucket lowered, 5 ft 9½ in width and 5 ft 7 in to 5 ft 9 in height. Tracks are independently driven by two five-cylinder radial motors, each developing 12 b.h.p. They are of open construction, allowing the machine to be turned in its own length. The standard bucket is of ½ cu. yd capacity and covers the full width of the track. It can be adjusted to give four digging positions to a maximum depth of 4 in, and is raised by a simple overhead rocker-arm at a loading rate of five or six buckets a minute. Power for this function is supplied by a single 12-b.h.p. radial engine.

Air-pressure range is 60-115 lb/sq. in., with a designed working pressure of 90 lb/sq. in. Compressed-air consumption is assessed at 350-400 cu. ft./min. The weight of the machine, with flat track shoes, is approximately 9,000 lb. Travelling speed, with the standard gear-ratio, is 2½ m.p.h.

Shovel Attachments

Mounted on a Bristol 25 industrial tractor with extended tracks, the latest Bristol 'Digloader' Mk. II, produced by the Conder Engineering Co., Ltd., was shown by **H. A. Saunders, Ltd.,** London, the world distributors. It has a 15-cu. ft. digging shovel pivoted to the lifting arms that are pivoted to a frame at the rear of the tractor, permitting overloading at a height of 9 ft 9 in, as well as forward loading at 6 ft 6 in, and excavating. The tractor has a Perkins P3-144 three-cylinder diesel engine, three-speed gearbox and a Dowty gear-type hydraulic pump for operating the side-arm and bucket-control rams. A substantial cab gives the driver full protection.

Shown fitted to a 'Fordson Power Major' tractor, the new A7 Skyhi hydraulic loader produced by **Skyhi, Ltd.,** Isleworth, is basically similar to the previous A5 type. Unlike the latter, however, the whole of its hydraulic equipment operates entirely independently of that installed on the tractor. This gives the advantages of increased power, quicker action, and instant accessibility to all parts requiring periodical attention. Hydraulic power is obtained from a Hamworthy gear-type pump driven directly and continuously off the front end of the engine so that the oil is circulated and warmed up immediately the engine is

arted and is thus in the best condition for operating the ader when required. The oil reservoir is mounted vertic-lly on the nearside upright supporting member to which e main lifting arm on that side is pivoted. Behind this are e independent controls for the lifting arm rams and the uck retrieving ram. The latter is single-acting, and the uck is released by hand-operated trip mechanism. The tting of a double-acting ram, eliminating hand control, is possible development.

For trenching, ditching, hole-digging and face-shovelling, e latest J.C.B. 'Hydra-Digga' attachment, manufactured y J. C. Bamford (Excavators), Ltd., was exhibited by hos. **Ward, Ltd.,** Sheffield, mounted for the first time n a 'Track-Marshall' Perkins diesel-engined crawler racto Further details of this attachment may be found nder e J. C. Bamford entry. Trenching buckets from in to 52 in wide and a forward-acting face-shovel of cu. capacity are available. Hydraulically controlled abilizing outrigger-legs are fitted. The 'Hydra-Digga' can e quickly detached when the tractor is required for other perations.

Excavators

said to be the first British-built excavator in its capacity ange to be fitted with a torque converter as standard equip-ent, the new 'Tiger' V-XLT, shown by **Priestman Brothers, td.,** Hull, is mounted on crawler tracks and operates a $\frac{3}{4}$-yd dragline bucket at a radius of 35 ft. The tracks are 11 ft 7 in ng and are fitted with 24-in plates, giving a ground-pressure of less than 5 lb/sq. in., and this can be further educed by fitting 30-in plates, which will be available hortly. The track width is 10 ft 2 in. The machine's erformance capabilities emphasize the advantages of the ecently introduced Priestman cross-roll-bearing slewing ng now fitted to the 'Cub' and 'Tiger' excavators.

The 'Cub' V excavator can be equipped with an Arm-trong Siddeley air-cooled engine or a water-cooled unit if preferred. It was exhibited fitted with a new gooseneck oom and dragshovel fabricated from deep-section folded late, and with large-diameter sheaves and horizontal bail-lock to give straight rope leads. It has a maximum digging adius of 23 ft, discharge radius of 19 ft, discharge height of 14 ft 6 in and digging depth of 15 ft. Two buckets avail-able are the 'Precat', with 30-in cutting width, and a 19-in bucket which cuts 23 in with side knives. The machine is convertible to an 8-cu. yd. dragshovel, luffing shovel, or skimmer, and can be used for crane and grab operations.

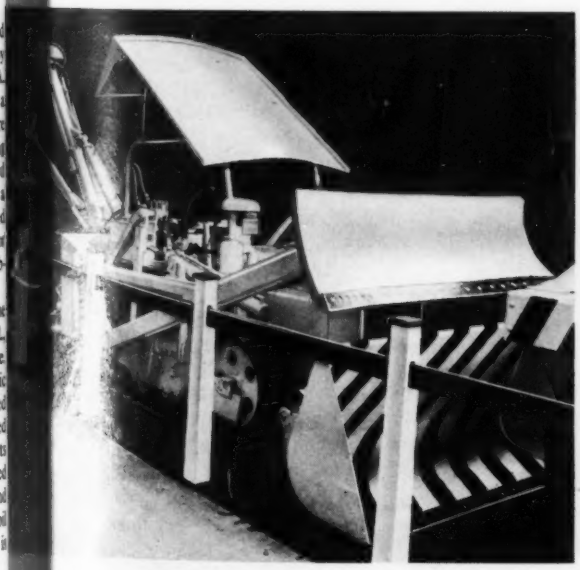
Exhibited by **Thomas Smith & Sons (Rodley), Ltd.,** with face-shovel equipment, the Smith 8 crawler-mounted excavator is the smallest in the Smith range and is available with 8-cu. ft. buckets on all digging attachments. Buckets of $\frac{3}{8}$ cu. yd. capacity are available for operating on easy materials. The machine can be used as a face shovel, trencher, dragline, crane, grab-crane or piledriver. The standard track width is 12 in, giving a ground-pressure of $7\frac{3}{4}$ lb/sq. in., but for lower pressures 16-in and 21-in tracks are available. Water-cooled or air-cooled diesel engines, developing 28 b.h.p. at 1,300 r.p.m., and with 12-V electrical starting, are optional. Alternatively, a 20-h.p. continuously rated electric motor can be installed.

To increase its digging capacity and reduce maintenance and driving fatigue, the Smith 21 universal excavator, exhibited with gooseneck attachment, has been completely modernized. A patented power-lowering unit permits loads to be lowered at approximately one-ninth of the rated hoisting speed without slip, providing perfect load control. The unit is inexpensive and can be easily fitted to a standard machine. Power-derricking, another new feature, provides independent high-speed derricking motion, and a swing-brake holds the revolving superstructure relative to the carriage when operating in high winds or on sloping ground. In addition, a folding high A-frame can be fitted as well as a 30-ft basic jointed boom and telescopic safety stops. Optional to the standard Gardner 6LW diesel can be installed the Leyland 375 72-b.h.p. engine, the Petter McLaren air-cooled diesel, or a 40-h.p. continuously rated electric motor.

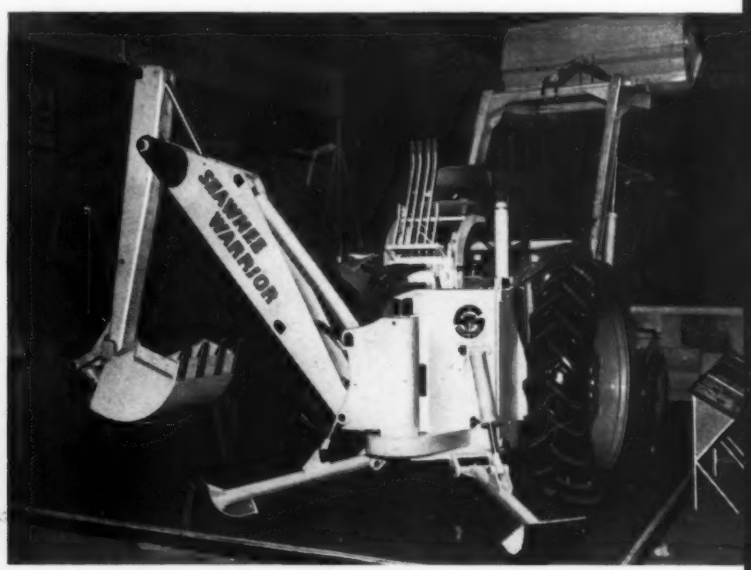
Grabs and Digging Attachments

The new Esco $\frac{3}{4}$-yd dragline bucket is one of a range made by Hadfields, Ltd., Sheffield, under licence from the Esco Co., of America, and was shown on the stand of **Thos. Smith & Sons (Rodley), Ltd.** Of alloy and manganese steel, it has teeth of the box-point and adaptor type. The box points are cast in Esco 12M alloy with points taper-hardened to resist wear. They slide on to the adaptors fixed to the bucket and are held by locking pins. They can thus

Shawnee Scout' trenching attachment mounted at the rear of a Bristol ractor. The tractor canopy is tilted up to give headroom for the operator ated at a high level



The 'Shawnee Warrior' digger attachment, produced by Steel Fabricators (Cardiff), Ltd., can be mounted at the rear of nearly all makes of tractor



be replaced when worn, with considerable saving in cost. The drag and hoist chains are of manganese steel, and the dump block is waterproof, being fitted with pre-sealed Timken roller bearings.

An unmounted example of the new cambered-boom drag-shovel attachment as fitted to the 22-RB base machine was seen on the stand of **Ruston-Bucyrus, Ltd.,** Lincoln. The boom is 19 ft long and the hoe-type dipper is of ¾-cu. yd. capacity. The dipper is normally fitted with pick-pointed side cutters, but for accurate trimming blade-type cutters can be supplied. In operation at normal speed on a 22-RB machine the digging pull is 26,000 lb and the hoist pull 33,500 lb. The maximum cutting radius is 31 ft 9 in, the end of dump clearance under dipper is 14 ft 6 in, and the maximum digging depth below ground level is 20 ft 3 in. A Ruston 6YDAN air-cooled diesel engine of 66 h.p. is a new feature of the 22-RB machine, which was shown mounted on a Foden six-wheel chassis and equipped with a lifting crane of 22 tons capacity.

Refinements have been added to the ¾-cu. yd. hydraulic grab since its introduction earlier this year by **Whitlock Bros., Ltd.,** Great Yeldham. It has been generally strengthened and the braking mechanism has been incorporated in the universal joints to steady the grab so that it can be slewed through the full 190 deg at full speed without excessive swinging. Replaceable manganese-steel baseplates of a new type are now fitted as standard, together with eight teeth of the Dinkum Digger Major type, and flat baseplates are also available for handling loose materials. Down-pressure digging renders the grab exceptionally suitable for excavating square-sided holes for piers, sumps and pylons, and the 190-deg slew is particularly advantageous in loading operations. In addition to a new range of 42 in and 54 in digging buckets for the 'Dinkum Digger Major', a new ¾-cu. yd. forward shovel has been introduced for loading and digging out banks, face-work in quarries and similar operations. A linkage has been used that permits the load to be discharged by rapid tilting of the bucket, avoiding the use of back doors and latches.

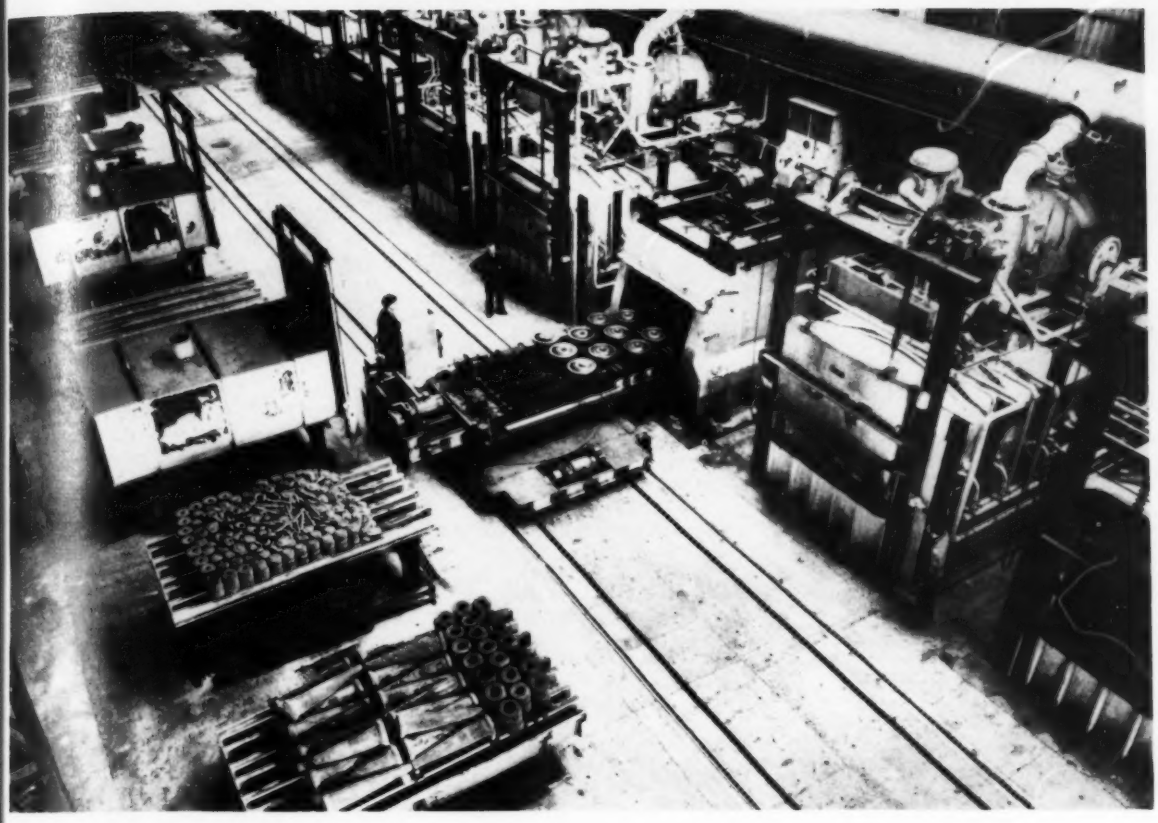
A new attachment for the 'Dinkum Digger Major' excavator is the Whitlock ¾-cu. yd. hydraulic power grab for loading and unloading bulk materials in and out of railway trucks and into hoppers up to 10 ft in height, and for excavation to a depth of 16 ft. High-speed working results from the tremendous pressure that can be exerted on the bucket teeth as they are being closed. A special feature is the ability to dig square-sided holes to a depth of 9 ft.

Another new production, shown by **Steel Fabricators (Cardiff), Ltd.,** was the 'Shawnee Warrior' digger attachment, which can be fitted to most tractors. The boom consists of two pressings welded together and reinforced. By means of a chain and sprocket pulled by single-acting hydraulic cylinders on the main frame, it can be swung through an arc of 180 deg and will dig at right angles to the tractor. Cushion valves in the hydraulic circuit ensure smooth operation. Stabilizer legs, operated independently to enable the machine to work on hillsides, have a 7 ft 6 in spread and point forward of the main frame at an angle of 45 deg. The bucket arm is of box construction, and within the box is installed the bucket-operating cylinder which slides the bucket-actuating link up and down a roller track. Buckets, with replaceable teeth and reversible side-cutters, are available in sizes from 12 in to 36 in. The dumping height is 8 ft 10½ in with bucket closed and 12 ft 4 in with it open; the reach behind the rear axle is 17 in; and the maximum digging depth, 11 ft 3 in.

H. A. Saunders, Ltd., London, exhibited a Bristol tractor as recently adapted for the mounting of the latest 'Shawnee Scout' D.70 H.L. trencher attachment made by Steel Fabricators (Cardiff), Ltd. This has a 2-cu. ft. bucket controlled by a single hydraulic ram. Only one ram raises and lowers the boom, while two are used for slewing through an arc of 105 deg and for operating a pair of stabilizing outrigger legs. Two vertical screw-jacks facilitate the coupling and uncoupling of the attachment, which is secured at four points by quickly removable pins located to suit other attachments. A canopy with Perspex windscreen protects the operator, whose seat has a hinged back that can be raised so that he sits at a higher level to control trenching operations. The canopy is hinged and can be tilted up to give the required additional headroom. Buckets from 10 in to 24 in wide for normal trenching, and 32 in and 34 in wide for grave-digging, are available.

To enable their 'Power Handle' swing shovel to unload bulk materials from railway wagons and road vehicles or pick up from stock piles, **Power Handling, Ltd.,** Bingley, have introduced a new luffing jib extension of cranked design and a hydraulic grab. These can be quickly detached and replaced by a standard loading bucket or other attachment. The extension is raised and lowered by connection to the same pivoted lever by which the bucket is hydraulically operated. Positive down-pressure can thus be applied to the grab to assist penetration into hard material. The grab can be raised to give a maximum clearance height of 11 ft 9 in to the front or side, an outreach of 9 ft at the front and 8 ft at the side, and a depth below ground level of 6 ft 11 in at the front and 4 ft 6 in at the side. The two shells of the grab are suspended from the mounting of the vertical hydraulic ram, and attachment brackets with engaging teeth are pivoted to a cross-member to which the ram is applied. The capacity of the grab is about 4½ cwt of coal or 7 cwt of wet gravel.

'Power Handle' swing-shovel fitted with the new cranked-jib extension and hydraulic grab



This picture shows the general layout of the plant, with the turntable charging machine withdrawing a batch of turbine discs from the oil quench machine. On the near side of the charging machine is the range of loading tables, slow-cooling chambers and a forced air cooling table

NEW HEAT TREATMENT PLANT

THE COMMISSIONING of the new central heat treatment plant at the Darley Dale works of Firth-Derihon Stampings, Ltd., has achieved considerable economies in man-hours and a reduction of 75 per cent in the maximum number of heat treatment furnaces in operation.

Much greater accuracy of heat treatment procedure is now possible, and the whole range of the highest quality alloy and carbon steels, nickel based alloys and titanium alloys can be treated. Thus, the entire heat treatment requirements of the company are now concentrated at the Darley Dale works.

Some idea of the general layout of the plant is given in the accompanying illustration.

The charging machine used in conjunction with the loading tables, furnaces and oil quench machine is an all-electric four-arm turntable design arranged for 5-ton loads. Four motors are used for hoisting, lowering, charging and discharging, traversing and rotation. Power is supplied to the charging machine via a specially designed motorized cable-drum unit, mounted on the charging machine, the feed cable being laid down in a small duct below floor level.

The general layout has been designed to handle large and small batch production efficiently and to eliminate manual handling as the plant has to deal with a wide range of forgings varying in weight from a few ounces up to about 800 lb.

All incoming materials are received into the reception bay in stillaged form; diesel-engine fork lift trucks and electric battery-operated stillage trucks are used for the movement of all stillaged loads into the storage area, between the storage area and the loading tables, after treatment, and for the movement of stillaged loads to the adjacent inspection department.

In the main heat treatment bay, electric overhead cranes are used for assembling the heavier forgings on the loading tables, etc. Dependent on the weight and section of the forgings to be treated they are loaded into special heat-resisting furnace trays or on to heat-resisting bearer-bars. After the load has been assembled on the loading table it operates as unit load throughout all subsequent operations in the heat treatment department.

A survey of mobile conveyors and elevators, portable and transportable conveyors, and similar equipment — Part 13

'NON—FIXED' CONVEYORS AND ELEVATORS

By J. M. Beskine, B.Sc. (Eng)

AN INTERESTING RANGE of mobile conveyors and stackers is made by C. J. R. Fyson & Son. These machines include both bulk materials handling conveyors and stackers, and unit load machines, for warehouse use and for lorry loading and unloading, and they are available in variable discharge height and fixed discharge height versions. The present review deals in the main with belt conveyors and stackers, the principal specialities of the firm, and describes machines designed to handle sand, gravel, agricultural lime, chalk, coal, coke, and similar materials. Readers interested in further details of Fyson unit load machines (which are briefly dealt with elsewhere, below) should get in touch with the firm.

Generally speaking, Fysons' smaller conveyors are employed as loaders, the larger machines being employed as stackers. However, for intermediate lengths of boom, the two applications largely overlap. A typical small variable discharge height troughed belt conveyor is shown in Fig. 173. This is a type EB loading conveyor, 18 ft in length, and is largely used for loading loose materials into road vehicles and railway wagons. This conveyor is driven by a 2½-h.p. petrol engine, through a roller chain and a Fenner torque-arm speed reducer, as shown in Fig. 174. The photograph also shows the method of raising and lowering the conveyor boom, through twin totally enclosed screw-jacks, by means of a centrally placed handle on the tubular axle.

Longer troughed belt conveyors are made in various ranges. The size range immediately above type EB mobile conveyors, is type SB, a typical example being shown in Fig. 175. The conveyor illustrated is 28 ft in length, and machines in this range are made in lengths of up to 40 ft. It will be seen that the engine, gearbox and snub drive, as well as the belt take-up and the hydraulic raising gear, are all housed in the enclosed box near the wheels. The makers claim that this arrangement provides an exceptionally good balance, together with a large and clear overhang and an absence of machinery at the tail of the conveyor. One advantage of having a minimum of machinery at the tail end of a conveyor is, of course, elimination of the risk of having it inundated during loading—a very important factor if abrasive or corrosive materials are being handled.

Longer versions of type SB machines have the same undergear design as that shown in Fig. 175, this being correctly placed at the right point of balance. As can be seen from Fig. 176, this point of balance varies according to the hopper employed. By paying careful attention to provision of balanced conditions in all machines, very good mobility is obtained. A case in point is shown in Fig. 177. This is a Fyson SB mobile stacker in towing position behind a Land-Rover. The point to note, here, is that although easily towed by a car or lorry, etc., this conveyor is quite long, 40-ft, and can stack to a considerable height

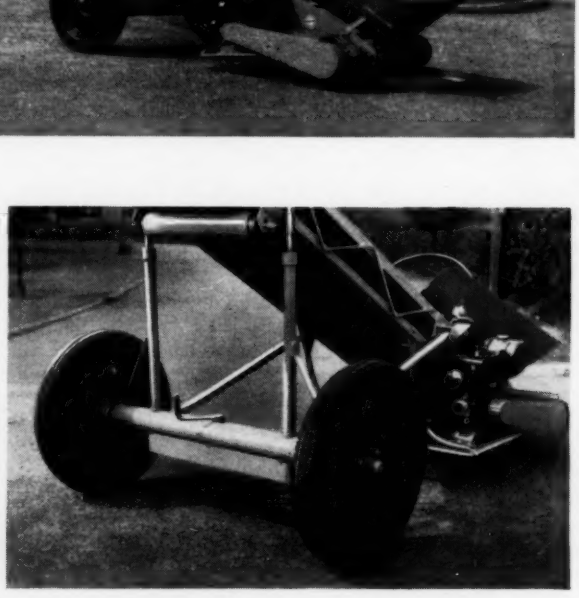
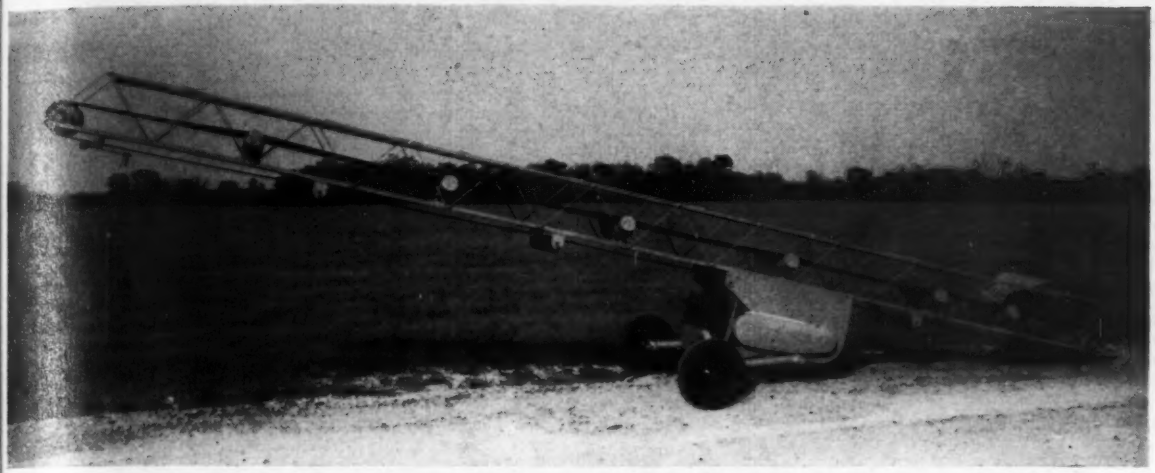
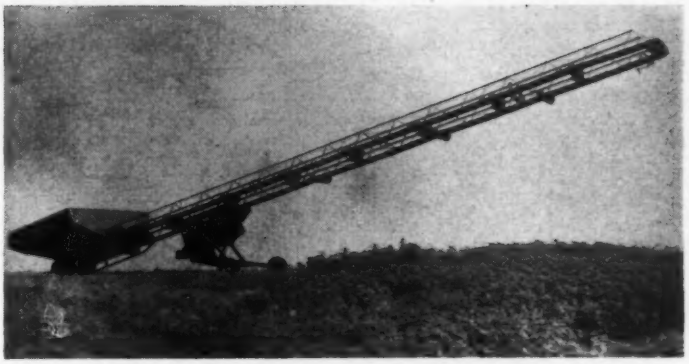


Fig. 173. Fysons' type EB bulk materials variable height loading conveyor 18 ft in length, as used for road vehicle and railway wagon loading, etc. This is typical of the smaller conveyors made by Fysons

Fig. 174. Close-up view of type EB conveyor under-carriage, showing centrally placed handle which raises and lowers the boom through enclosed screw-jacks. The driving unit is a 2½-h.p. petrol engine, transmission being via a roller chain and a Fenner torque-arm speed reducer



RIGHT
Fig. 175. Fyson type SB 28-ft variable discharge height loading conveyor. Note compact elevating gear, engine and transmission unit assembly at point of balance, also unencumbered tail end



ABOVE
Fig. 176. Example of a longer type SB stacking conveyor made by Fyson & Son. This machine has a tipping hopper and hydraulic elevating gear

BELOW RIGHT
Fig. 177. Fyson mobile stacker in towing position behind a Land-Rover. This machine can load directly into ships' holds and into bins, and it has a considerable stacking height

from a tipping lorry. Furthermore, it can load directly into ships' holds, with a clear overhang from the quay of no less than 26 ft. And, for similar reasons, it is ideal for loading directly into bins.

The shorter Fyson conveyors, normally regarded as loaders, may also be used as stackers, as shown in Figs. 178 and 181, by slewing them in order to make an annular stockpile, thus accommodating a large pile of materials although employing a reduced delivery height.

Heavy-duty Belt Conveyors

Type SB mobile belt conveyors are quite lightly built machines, the main emphasis being upon provision of good manœuvrability and easy towing on the highway. A similar range of machines, especially designed for extra-heavy duties, is also made by Fysons, type TE conveyors. Examples are shown in Figs. 179 and 180.

Type TE mobile conveyors are built in standard lengths of 40 ft, with 24-in belts on troughing idlers or flat idlers, with flare plates, as shown in Figs. 179 and 180. Diesel engines of 5 to 6 h.p. are employed, or electric motors, and load capacity is equivalent to 185 tons of coal per hour, raised to a height of 17 ft 6 in at a belt speed of 350 ft/min. (This is also equivalent to 90 tons of coke per hour.) Extracts from the specification may be of interest, as they show how Fysons build ruggedness and utility into a manœuvrable machine. The conveyor boom is stressed to the British Standard for crane structures to provide maximum strength with a minimum weight. The idlers run in grit-proof ball bearings, and the load-carrying side may be provided with 5-in dia 3-roll troughing idlers or 4-in dia straight tubular idlers with 9-in steel flare plates, depending upon the nature of the load. Under the hopper, close-pitch flat idlers are employed. The ball bearings fitted to all shafts are Neoprene-sealed and require no lubrication. The hopper has rubber side curtains and is available in widths of up to 9 ft. And, if required, a rotary brush belt cleaner may be fitted as an extra.

Long-reach Stackers

Fyson long-reach stackers are made in lengths of from 50 ft to 70 ft. These are generally similar to the machines already described, the engine, clutch, reduction gear, snub drive, hydraulic boom raising gear, and belt take-up, being enclosed in a box below the boom, at a carefully chosen

point of balance. However, in order to obtain great boom strength without unnecessary weight, a bowstring type of construction is employed, as shown in Fig. 182*a*. This type of machine is Fyson's type AB mobile stacker.

Type AB machines are readily towed on the highway, as shown in Fig. 182*b*, which shows a 70-ft stacker passing through a provincial town. Fig. 182*c* shows details of the undergear box and its contents, as employed on 60-ft and 70-ft machines, the main point of interest being the access to the engine at a reasonable working height from the ground.

Handling Sand and Gravel

In the sand and gravel trade the erection of a large stationary processing plant is often considered a poor financial risk. Where the quantities of material likely to be available on a site are more or less uncertain, and where there is the danger of running out of a material being extracted, the continued use of large and expensive fixed equipment may entail high costs for transportation of the as-dug material. In such a case a small mobile plant is obviously preferable. However, the minimum size of mobile plant is fixed by labour costs. The maximum economical advantages, generally speaking, is associated with the use of the maximum size of easily transported plant, a minimum crew of two men being an obvious 'must' in any case. Fig. 178 illustrates a typical example.

BELOW
Fig. 178. *Handling sand and gravel from a transportable plant by means of Fyson mobile conveyors*

TOP LEFT
Fig. 179. *Fyson type TE* 40-*ft heavy-duty mobile stacker at work handling coke from a Taylor Jumbo grab*

LEFT
Fig. 180. *Fyson type TE* 40-*ft heavy-duty mobile stacker handling coal from a tipping lorry to a stockpile*

181

Fig. 181. Working methods employed in a typical chalk pit. Tractor-mounted implements win the chalk and feed it into the mobile conveyor hopper, left, whence it goes to a lime plant and is then stockpiled by a second mobile conveyor

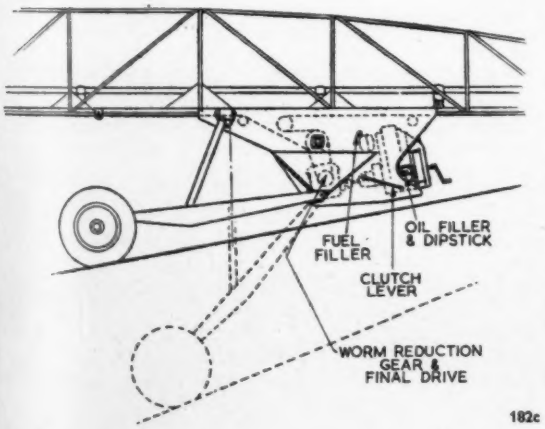
Fig. 182a. Fyson type AB 70-ft stacking conveyor building a 30-ft high stockpile of chalk

Fig. 182b. Fyson 70-ft type AB stacker being towed by tractor through an English provincial town

Fig. 182c. Undergear box of 60-ft and 70-ft type AB stackers, showing good access to the engine at a reasonable working height from the ground

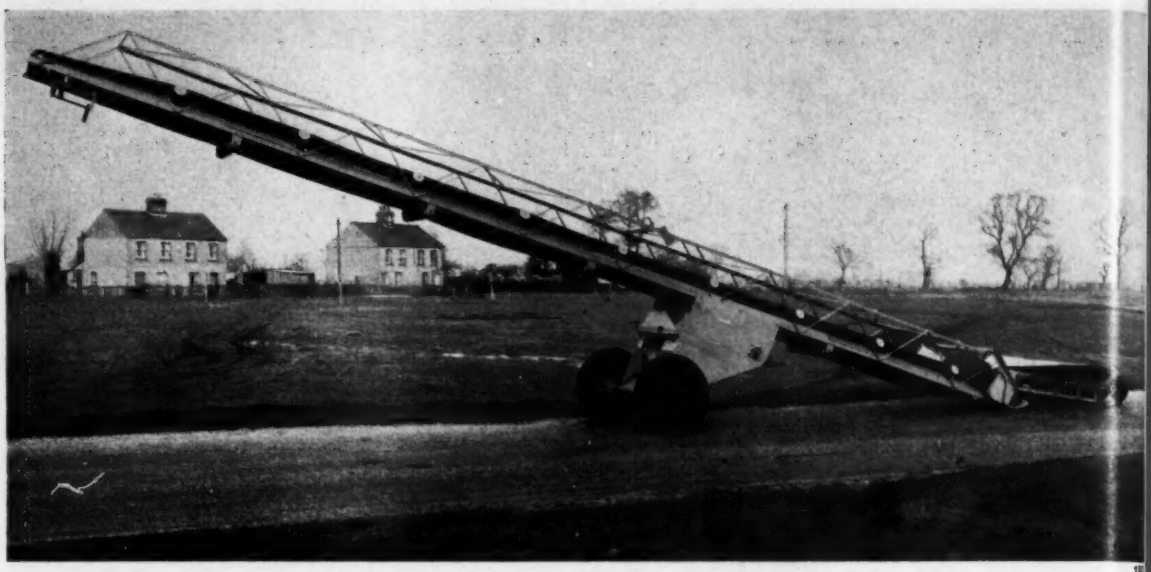
182a

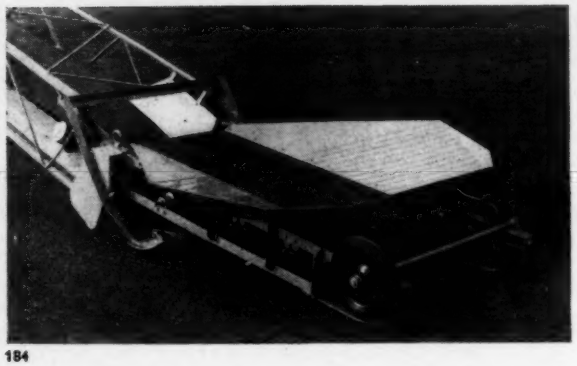
182b



182c

This shows a small transportable plant which is capable of being moved close to the source of materials being extracted, thereby enabling road transportation of as-dug sand and gravel to be avoided. In this instance, if mobile conveyors were not employed, one of two changes would have to be made to the plant illustrated. Either the whole plant





184

would have to be raised in order to gravitate the output of materials to some extent, thus making the equipment unwieldy or impossible to move on the road, or output conveyors would have to be hung on to the plant and probably removed for separate transportation by road.

The conveyors actually employed in the plant shown in Fig. 178 are worth brief consideration. To the right of the sand and gravel plant is a 40-ft type SB light construction conveyor. In the background is a heavier type AB stacker. Both machines are capable of slewing. It will be noticed that the output chutes from the sand and gravel plant can be rearranged to feed different conveyors, so that a minimum number of conveyors is able to handle the different materials graded. The use of electric drives, in this case, does not impair mobility, because the power is provided by a

Fig. 183. *Fyson type TE* 40-*ft heavy-duty diesel-powered loading conveyor, as used for handling open-cast coal directly from the auger*

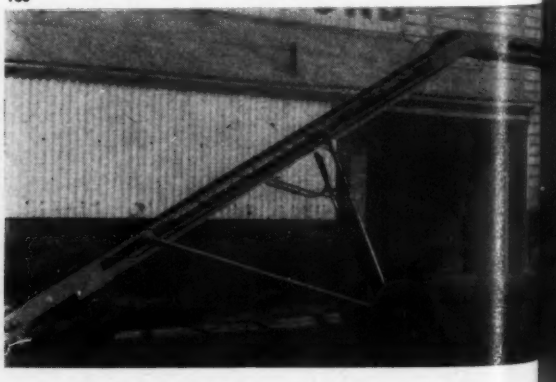
Fig. 184. *Low headroom hopper and hopper feed belt of loading conveyor shown in Fig. F.*11

Fig. 185. *Type EB* 18-*ft unit load loading conveyor of the roller chain and slat bed type*

Fig. 186. *Type EB* 30-*ft unit load swan-neck loader with reversible chain and slat bed*

185

186



transportable diesel generating set, which also powers the transportable processing plant.

Handling Agricultural Lime

Mobile processing and conveying equipment is popular in the agricultural lime trade for similar reasons to those already given for the sand and gravel trade. Fig. 181 shows a typical small site, and illustrates the complete process involved in the winning of chalk. In this instance the chalk is scraped from the surface of the pit and dumped through the opening in the roadway of the short bridge on the left of the photograph. The chalk drops into the hopper of a Fyson type SB conveyor, in this case a diesel driven machine. The conveyor feeds the chalk into a mobile processing plant.

The absence of machinery at the tail of the conveyor is advantageous because of the small free space beneath the bridge. The processing plant shown in the illustration is a Fyson type JB lime plant, and the output from this machine is stacked by the second mobile conveyor, a type SB 28-ft stacker. As a point of interest it may be noted that this conveyor was used for some 12 months, being engaged on formation of an annular stockpile, the machine being slewed accordingly. It was then decided that a larger stockpile should be maintained, and a Fyson type AB 70-ft stacker was therefore moved in for this purpose, the previously used 28-ft stacker being transferred to stacking flints screened from the chalk.

Handling Open-cast Coal

Fyson type TE mobile conveyors, already briefly described, are popular on open-cast coal sites. Fixed discharge height machines are often used, a typical example being shown in Fig. 183. This conveyor has a carefully positioned lifting eye. This enables the whole conveyor to be lifted on to a crane hook without using slings, and to be lowered into an otherwise inaccessible part of the site. The machine shown in the photograph was designed with a low headroom hopper. This is able to enter beneath the coal auger which wins coal from the quarry face, the ground clearance being only 15 in.

The hopper of this conveyor is shown in the close-up photograph, Fig. 184. It will be seen that the hopper has a separate flat belt, driven from the conveyor tail drum. The use of a separate belt in the hopper is dictated by the fact that the hopper belt must be almost horizontal, because of the limited headroom. Advantage is taken of the arrangement to provide a very heavy belt at the point of loading, whereas a less heavy belt is quite adequate for the conveyor itself.

Variety of Conveyor Hoppers

Whereas conveyor design standardization makes for efficiency and economy, this principle cannot so easily be applied to hopper design. In general, hopper design has to be quite flexible. Fyson design policy is to make all mobile conveyors available with a range of hoppers, varying from a small chute hand-filled hopper, as shown in Fig. 173, to large hoppers of the type shown in Figs. 179 and 180.

The hopper shown in Fig. 180 is, in fact, separate from the conveyor, and is carried on four steel castors. This hopper has an adjustable front which is raised to render the hopper self-emptying when used with a grab when stacking coke, as illustrated in Fig. 179. The adjustable hopper front may be lowered to allow the use of a tipping lorry when stacking coal, as shown in Fig. 180.

Unit-load Conveyors

Mobile unit-load conveyors are also made by Fysons. These are available in lengths of up to 70 ft, as slat conveyors and roller bed flat conveyors, for the handling of boxes, sacks, etc. Fig. 185 shows one example, a Fyson type EB conveyor, 18 ft in length, fitted with roller chains and wooden slats. Fig. 186 shows another model, a type EB swan-neck machine, 30 ft in length, as used for stacking boxes and sacks of up to 18 stone in weight (252 lb.) This machine is reversible for off-loading and is fitted with a stop switch at the head end.

MAINTENANCE OF CONVEYOR BELTING

A New Industrial Film

A NEW FILM on *The Care and Maintenance of Conveyor Belting*, produced by the Dunlop Rubber Co., Ltd., was given a showing in London recently. The film is intended for mining and factory managers and for general industrial audiences. Its main aim is to illustrate the points on which the effective life of a conveyor belt depends, with particular reference to the importance of proper care and maintenance. During the making of the film, Dunlop received valuable assistance from the National Coal Board, and many of the sequences depict the kind of hazards encountered by conveyors working in mines. Mr. H. E. Longden, N.C.B. director of production, who was present at the showing of the film, revealed that a total of £15m per annum was spent by the N.C.B. on conveyor belting alone.

A few of the main points brought out by the film were as follows:

A conveyor belt consists of two parts: the carcase, which is constructed of layers of fabric, and the outer cover, which is made of either rubber or p.v.c. Rubber, which is still ideal for many purposes, should not be stored in cold, damp places, nor exposed to the sun, as it may perish; p.v.c. belting, which is recommended for specialist applications on account of its greater resistance to abrasion, immunity to oil and grease and the fact that it does not support combustion, may harden under conditions of extreme cold, but will soften again when returned to a warm atmosphere. It, too, is better stored indoors.

When belting is required for service, it should be withdrawn in rotation, the oldest in stock being the first out. To avoid risk of damage, ropes, not chains, should be used for hoisting, although care must be taken to prevent them rubbing or chafing against the edges. Belting is normally ordered and supplied to length, with the ends made ready for joining, but if it has to be prepared for joining locally, it can easily be cut with a sharp knife, a set square being used to ensure that the cut is made at right-angles. Alternatively, a special belt-cutting machine can be used. After cutting, one inch should be trimmed off the width at each corner, so as to prevent the join catching while the belt is in operation. Every cut edge should be treated to prevent moisture from getting into the fabric.

The successful operation of conveyor belting depends on four main points: the choice of the right type of belt for the job in hand; its proper storage prior to use; correct and careful preparation and installation; and proper care and maintenance. *The Care and Maintenance of Conveyor Belting* is intended to emphasize these points. Sixteen-millimetre black and white copies are available on free loan from: The Dunlop Film Library, Wilton Crescent, London, S.W.19.

CAREERS IN MECHANICAL HANDLING — 3

Industrial Power Trucks

By John R. Sharp*

This is the third article in a series directed to the young man entering the manufacturing side of mechanical handling equipment, showing him the various openings in this field. The first two articles dealt with Aerial Ropeways and Crane Manufacture respectively. Other articles in this series will deal with conveyors and bulk handling; mobile cranes; and lifting tackle. Executives amongst our readers are asked to bring this series of articles to the attention of their young staff who might be interested.

THE TITLE of this article is one that encourages me to the utmost of my enthusiasm. In my opinion there is no other subject that compares with materials handling to give a more ready stimulus to the better use of man power. Year by year we are making more and more mechanical power available, and yet only very slowly is it dawning on so many that men must be used for the brain power and manipulative skills they can bring to a job: using their muscle or brawn must be avoided wherever ingenuity can devise its mechanical substitute. It has been estimated that a muscular energetic labourer exerts ⅛ h.p. How crazy this seems when you think that the average small lawn mower has the power output of perhaps eight men.

Of Great Britain's total labour force, just over 40 per cent is employed in the manufacturing industries, just over 20 per cent in transport and distribution, and a large part of the remainder is with agriculture. Quite apart from the phases of materials handling already mentioned, what a comparatively unexplored side there still exists in agriculture—easier handling in the fields and on the farms.

Britain is a highly industrialized nation, almost unique in the world.

Leaving distribution, warehousing, transport and so on, let us just consider industry, as what I say about industry applies just as much in the other categories.

Industry itself consists of a complex process of passing materials through a wide range of manufacturing operations from raw materials to finished products. So much of the capital invested in British Industry is related to equipment in our various factories which is used in this complex process. Obviously, then, anything which can be done to improve the return on the invested capital is not just a desirable thing with which to meet competition; it is a vital and sometimes a critical economic necessity. The joining up of one manufacturing process to another, be it movement of parts through an engineering works or products between factory and consumer, has come to be classified under the one heading 'Materials Handling'.

John R. Shar

The Cost of Handling

It was estimated some four or five years ago that British industry spends something like £800,000,000 a year on materials handling. It is also known that the cost of moving materials about is frequently higher than the actual costs of processing, and many times it is even higher than the combined costs of the material and the processing. There is in this field of materials handling the need for continuous study as to how materials handling methods may be improved. During the years between the wars we saw in Britain the emergence of a specialist type of executive, the production planning engineer. Consequently, this improved production efficiency took several turns for the better. All too often, however, these improved techniques were seldom, if ever, matched by parallel improvements in materials handling methods. Here I must repeat that old adage: moving or handling a product only adds to its cost but adds nothing to its value.

The result is that in Britain we have an enormous field for improvements in materials handling methods, in almost every imaginable phase of industry. Since the end of the last war many industrial organizations have been forced to the realization that it is in improvements in materials handling that the greatest economies can be gained. Consequently, many of these organizations are eager to employ a new executive, the materials handling engineer. Indeed some really enlightened groups have set up a materials handling study department, thus fitting itself not just to meet the day-to-day problems, but to research into even better materials handling methods for their particular needs.

I feel that one of the greatest difficulties which faces an executive seeking a solution to a particular materials handling problem is the bewildering array of equipment which can be used to solve the problem. Conveyors, monorails, travelling cranes and the like readily spring to mind. Each of these has its own particular function within the materials handling sphere. However, such is the inherent flexibility of British industry that almost the first requirement for any materials handling method is that the method itself will be flexible enough to meet the changing pattern of industrial development, product changes, market fluctuations and the like. Without question, I think that the industrial truck presents itself as by far the most flexible means of materials handling yet devised.

A mere thought will indicate that the industrial truck does not require any fixed path, neither does it need costly steel superstructures such as is the case with travelling cranes

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* John R. Sharp is a Joint Governing Director of Lansing Bagnall Ltd. He was one of the prime movers in the foundation of the Institute of Materials Handling and is a past National Chairman. He was a member of the specialist team on materials handling that visited the U.S.A. in 1949. Mr. Sharp is at present Vice President of the British Industrial Truck Association and a member of the British National Committee of the International Cargo Handling Co-ordination Association.

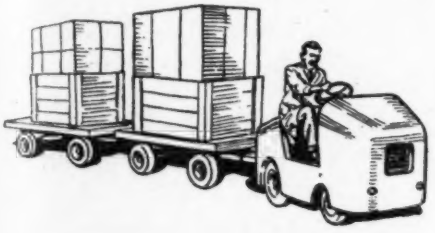
and so on. It is so flexible in its many uses that methods can be easily modified or completely changed to meet changing circumstances.

The very nature of its design permits it to go almost anywhere and the genius of detailed design permits it to operate in incredibly small spaces.

Growing Utilization

The industrial truck is here to stay, and I forecast that there will be a growing utilization of industrial trucks in industry both in Britain and abroad. Obviously, the more work one can provide for a piece of capital equipment the greater will be the return from the capital invested. If the capital equipment has a high degree of versatility and a wide range of application (such as is the case with industrial trucks), then the man who can design materials handling systems to make the utmost use of the available capital will contribute enormously to the prosperity of his organization.

It is significant that during the past three or four years a number of engineering colleges have begun to include materials handling as a subject in the curriculum. The man who can design a system to move materials efficiently will be one of, if not the, most profitable man on the production staff.



Obviously, then, there is great scope in Britain for the man highly qualified in materials handling engineering with a knowledge of plant layout and work study techniques, and in particular the industrial power truck expert, i.e. the man who knows by training and experience how to get the maximum utilization from industrial trucks and ancillary equipment, which as I have said are in any case the most versatile means of materials handling. There is an apparent dearth in Britain of such engineers, which constitutes the basic problem of materials handling; this is also shown in shortage of science graduates coming into industry. The field for opportunity in design work is simply enormous. As in medicine, once research has managed to isolate a disease, science can usually provide a cure. So it is with materials handling. If sufficient research is brought to bear, the researchers can, in association with the designers, find solutions to most, if not all, of the materials handling problems which beset industry, and, of course, transportation and warehousing.

Therefore, the opportunity for rapid promotion in the field of industrial power truck research, design and production, is, in my opinion, almost unlimited.

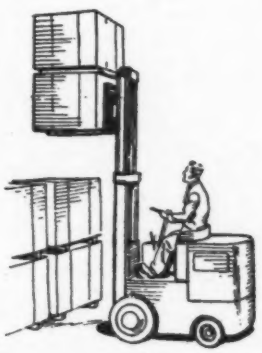
At the same time I think it fair to say that the industrial truck industry in Britain has largely created its own markets. That the market did exist and still exists goes without question, but it has been the industrial truck makers themselves who have developed the market to its present size. They have been people in most cases who offered the potential users the benefit of their experience and advice. Advice in applying the makers particular industrial trucks in the best way to particular materials handling problems has provided and will continue to provide one of the best means of developing the sale of industrial trucks to yet wider markets. But obviously the man who is going to do this class of work must have wide materials handling experience in regard to power truck application.

Markets for Trucks

It is very significant that the British industrial truck finds nearly half its market in overseas territories. We have a higher export ratio by far than any other industrial truck manufacturing nation. This is a creditable achievement of the industry in these 'export-emphasis' times, because competition from overseas in overseas markets is extremely powerful and becomes more so day by day.

These overseas territories have little or no tradition to follow and consequently the new industrial nations of the world are usually able to accept the benefit of experience gained over so many years in Britain. It is less difficult for many of them to introduce modern materials handling methods at the outset of any industrial development. This is often difficult for us with our frequently outmoded traditions. So there will be a growing need for qualified and experienced materials handling men to carry this gospel of mechanization into overseas markets. Here again is an enormous field of opportunity for the right kind of individual.

As with most things, it is upon the youth of the present generation that we must ultimately depend if we are to keep our place at the fore-front of world industry. It is even more important if we are to maintain our exports of manufactured products without which we cannot survive.



Qualifications

The breadth of knowledge or experience required to fill these functions can only be gained after a period of years. However, intending entrants into this interesting sphere of industry can equip themselves by taking study courses with this end in view. I would think that the minimum academic requirement to aim for would be the Higher National certificate in one of the branches of engineering, preferably mechanical or electrical, followed by graduate membership of the Institution of Mechanical Engineers. Such opportunities are open already through apprentice training schemes operated by most, if not all, B.I.T.A. members.

Alternatively, the intending entrant should equip himself with a school leaving certificate at advanced level. University graduates could probably best provide themselves with honours degrees in one or other of the sciences or in economics.

Should intending entrants aspire to overseas work, I would then think a detailed knowledge of a language would be the most desirable attribute. It almost goes without saying that any intending entrant should possess a ready command of our own language.

Quite apart from this, a student or graduate membership of the Institute of Materials Handling would also give a young man the opportunity of getting into contact with materials handling men of wider views and experience.

To summarize—there is already a considerably unsatisfied demand which is increasing every year for qualified materials handling engineers in all industries, in warehousing operations, in road, rail and air transport, and this alone should be encouraging to the student or young engineer to tie his ambition to specializing in materials handling.

Additional to this, the individual firms of the British Industrial Truck Association are always interested to have applications from young men keen on taking part in this growing industry. There are opportunities for designers, workshop technicians, maintenance and service experts, and sales engineers.

These manufacturers are as follows:—

British Industrial Truck Association Members

British Straddle Carrier Co., Ltd., East India Hou 208a Regent Street, London, W.1.

J. Collis & Sons, Ltd., Regent Square, Gray's Inn Ro London, W.C.1.

Conveyancer Fork Trucks, Ltd., Liverpool Ro Warrington, Lancs.

R. H. Corbett & Co., Ltd., Hydrum Works, Bu g Hill, Sussex.

Coventry Climax Engines, Ltd., Widdrington Ro Works, Coventry.

I.T.D., Ltd,. 95-99 Ladbroke Grove, London, W.11.

Lansing Bagnall, Ltd., Kingsclere Road, Basings ol Hants.

Materials Handling Equipment (Great Britain), Lt 40a Dover Street, Piccadilly, London, W.1.

Mathew Brothers, Matbro Works, Sandy Lane Nor Wallington, Surrey.

Ransomes & Rapier, Ltd., Ipswich.

Ransomes, Sims & Jefferies, Ltd., Orwell Works, Ipswi

Reliance Trucks, Ltd., Rail Works, Heckmondwik Yorks.

Shelvoke & Drewry, Ltd., Letchworth, Herts.

Wingrove & Rogers, Ltd., Acornfield Road, Kirk Trading Estate, Kirkby, Nr. Liverpool.

Yale & Towne Manufacturing Co., Willenhall, Staffs.

Book Reviews

FARM WORK STUDY: A Basic Guide for the Farmer, Poultry Keeper and Market Gardener. By Nigel Harvey, M.A., Q.A.L.A.S. Published by Farmer & Stock-Breeder Publications, Ltd., Dorset House, Stamford Street, London, S.E.1. 86 pages including 8 pages of art plates and 24 diagrams in two colours. Size 7½ × 5½ in. Price 8s. 6d. net.

Work study has been applied in the factory for some years, but it is only just reaching the farm. It can often offer the farmer large savings in manpower and drudgery by the systematic analysis of how routine jobs are carried out and the establishment of improved methods of work.

This book, the first on the subject to be published, is a simple and practical guide written on do-it-yourself lines by Nigel Harvey. In the light of his experience as a Kellogg scholar in the U.S.A. and as a member of the Agricultural Research Council's team of investigators into farm layout problems, he shows exactly how the reader can set about recording how a farm job is being done, analysing the results and applying the lessons.

Many pages of explanatory plans and diagrams are included with seven case-histories showing, step-by-step, how work study has been applied to save labour on general, poultry and market garden holdings. For instance, by recording and analysing the movements of a man feeding pigs, it is often possible to halve the time taken at a very low capital cost by the purchase of a cheap feeding trolley to replace the conventional bucket. This is a simple example—but the same principle can be applied to practically every routine farm task and operation, resulting in a tremendous annual saving of time, labour and expense.

F.B.I. REGISTER OF BRITISH MANUFACTURERS—1959. 31st Edition. Published for the Federation of British Industries by Kelly's Directories, Ltd., and Iliffe and Sons, Ltd. Price 42s. post free. Size 9½ in × 7½ in. 1,140 pages. Bound full cloth.

The *F.B.I. Register*, a comprehensive and accurate guide to a substantial cross-section of British Industry, contains lists of the products and services of over 7,500 member firm under more than 5,400 alphabetical headings.

In addition to the Classified Buyers' Guide there are seve other sections in the Register, giving addresses of compani and firms, and valuable information about trade associ tions, proprietary names, trade marks, etc. A featu providing a useful reference for buyers not fully conversa with British product terms is the French, German an Spanish glossaries. These give translations of every produ term used in the main buyers' guide, each being numbere for easy reference between the English headings and the translations.

As the only authorized directory of the Federation British Industries—the largest and most influential associa tion of British manufacturers—the *F.B.I. Register* compiled by the publishers in close collaboration with th Federation.

BRITISH STANDARD FOR TYRES FOR CRANE RAIL WHEELS (B.S. 3037 : 1958). Published by the British Standards Institution Sales Branch, 2 Park Street, London, W.1. Price 4s. net.

A worthwhile reduction in the cost of stocking replacemen tyres for crane rail wheels can result from the applicatio this new publication—an 11-page illustrated British Standar whose purpose is 'to limit the range of tyres for crane ra wheels, and to standardize dimensions and toleances'. Prepared by a B.S.I. committee of experts, the publicatio is the first of what it is hoped will become a series on dat for certain crane components (including further types o tyre).

The size range of the double-flanged tyres extends from 18 in dia × 4½ in width to 36 in dia × 9½ in width. Th clauses cover: dimensions, material, freedom from defects Brinell hardness, re-tests, inspection and testing facilities

The publication concludes with an appendix which provides useful notes on manufacture.

DEMONSTRATION

MECHANICAL HANDLING AIDS FOR POST-OFFICE STAFF

Standard and purpose-built mechanical handling equipment demonstrated by Post Office Engineering Department

By a staff reporter

AT A DEMONSTRATION staged by the Post Office Engineering Department, for the benefit of G.P.O. staff, handling equipment designed for general and special tasks was seen in operation. Such equipment formed a major part of the mechanical aids, electrical tools and submarine jointing gear, that were displayed on the site of a new telephone service centre at Orphanage Road, Watford, for the purpose of showing staff from various departments the tools available for their assistance.

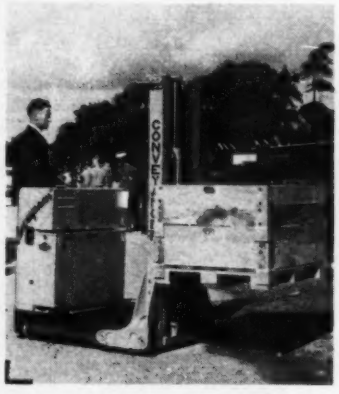
Covering as they did a wide range of functions, the exhibits were restricted to a few in each class. Machines suitable for stacking, for example, were represented by the 2,000- and 3,000-lb Conveyancer reach trucks and models VI and 1A 'Sherpa' stackers. The reach trucks were recommended to visiting staff for handling 40 × 40 pallets and for operating in a 75-in aisle for 90 deg stacking, with a 90-in width for turning.

With a straddle gap of 43 in, the 'Sherpa' VI is able to handle a standard post-office stillage or a 40 × 40 double-deck pallet. It is fitted with pneumatic tyres to enable it to be used on rough ground for offloading vehicles, and is used with 36-in forks for handling loads up to 5¾ cwt. The 1A is carried on the vehicle and serves the triple purpose of moving goods back to the tailboard, lowering them to the ground, and transporting them to the storage area.

Also carried on the vehicle is a Slingsby hand truck, of 450 lb carrying capacity, which has been found suitable for the transportation of floor-pattern switchboards from the works store to the subscriber's premises. The switchboard is strapped to the truck, and truck and load are pushed on and off the floor of the service van via a ramp formed by two lengths of steel angle—also carried on the van. Loading and unloading can be effected by one man, each runway being provided with removable safety stops, which hold the truck in position while he climbs into or out of the van.

Vehicles with a minimum capacity of 30 cwt can be equipped with a demountable jib, which is attached to the rear pole bolster stanchion and can be swung out over the tailboard and inward over the floor of the truck. A 'Minilift' hoist attached to the hook on the jib is used to raise loads of up to 8 cwt, thus demonstrating a method available for section stock deliveries and also for box-building parties.

For dealing with heavy stores, the recommended appliance was a 3-ton 'Jumbo' crane mounted on a special chassis powered by a Fordson diesel engine, with accommodation



ABOVE
Small 'Sherpa' stackers of this type are carried on the vehicle for offloading and transporting stores,

RIGHT
Conveyancer reach truck, with mast extended forward, handling 40×40 pallets made to G.P.O. specification by Horace W. Racey, Ltd., Wisbech

FAR RIGHT
'Sherpa' VI straddle stacker, fitted with pneumatic tyres for outside work on rough ground is used for offloading vehicles and low-level stacking

Slingsby television truck, loaded with switchboard, being pushed up ramp. Safety stops hold it on slope while operator climbs into vehicle

RIGHT
'Minilift' hoist attached to vehicle jib is used to handle unit loads of up to 8 cwt

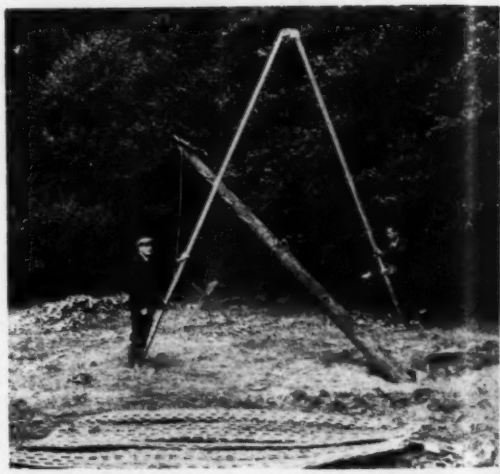
in the cab for a second person beside the driver. Cranes of this type, with a 4-ft run of travelling carriage, allow loads to be positioned with great accuracy, and are used for the reclamation of telegraph poles in addition to the duties mentioned.

Pole erection and replacement involve handling problems for which post office engineers are constantly striving to find better solutions. Among the equipment currently available for this work are pole-hole borers and pole-raising shearlegs, and vehicle-mounted ladders and working platforms. Among the earth borers demonstrated was a Cheshire 'Highway' model that could be driven either by a power take-off from the transmission of the transporting vehicle or by a separate Fordson diesel engine mounted on the vehicle. The tube enclosing the rack by which the boring head is raised and lowered carries a sheave round which is passed a rope attached to the winch that assists the work of pole-erection. The auger of this borer is made self-clearing by increasing the speed of rotation when the head is raised to the surface at the end of each stage.

An interesting method of pole-raising was demonstrated with the aid of lightweight shearlegs manufactured in Sweden. These take the form of a portable two-legged tubular appliance, incorporating a hand-operated pulley block with wire-rope tackle. The biped is set up straddling the pole and the pulley blocks are attached to it by clamps; thus, when lifting begins, the pole forms the third leg of a tripod.

For work on overhead cables, pole renewal, and tree-cutting, use is made of the Simon hydraulically operated working platform, turntable-mounted on a 5-ton Morris chassis. The upper and lower articulated booms can be controlled from the platform to give the operator a working height of up to 40-42 ft and a working radius of up to 25 ft. With a safe-load rating of 275 lb on hard level ground without jacks, or 750 lb if the jacks are lowered, this equipment can be used to raise men and materials to the required working level and position them precisely to suit their convenience as the work proceeds.

Of lighter construction and capacity was an extendible ladder of aluminium alloy, mounted on a turntable on the roof of a van. It is reached from the interior of the van and extended by means of a windlass and elevated by hand-operated hydraulic rams. One man can stand on a platform mounted at the extremity of the ladder and rotate it by pulling on a sash line.



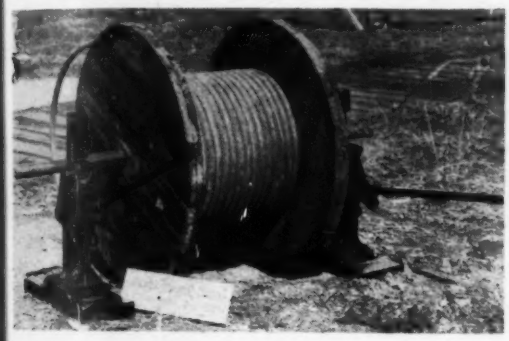
Pole being raised by means of Olssons portable lightweight shearlegs

BELOW
Spoil thrown off auger by fast rotation of Cheshire borer. Rope from winch passes over sheave carried on top of rack casing, which thus becomes pole-handling jib

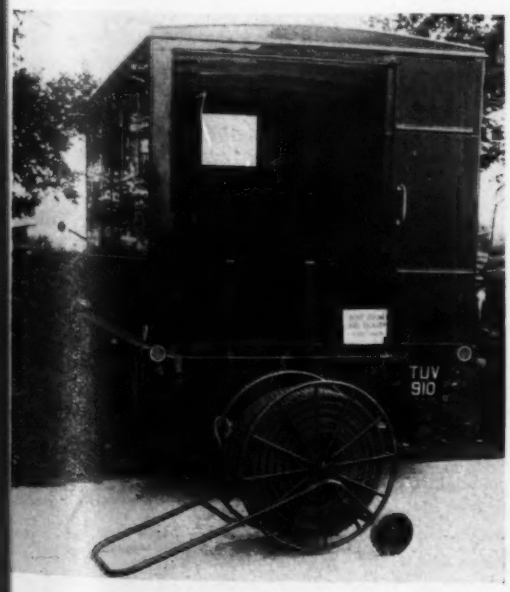
Among the smaller items of equipment was a Forge Craft trolley-mounted rope drum of simple tubular construction. The drum will take 210 yd of 3-in rope and rotates on a detachable spindle. The trolley is mounted on two rubber-tyred wheels. For supporting cable drums, there were jacks made of aluminium alloy which were 22 lb lighter than similar jacks with bodies of malleable cast iron. Accurate engagement of the pawl and rack in these jacks, which are manufactured by Prima Industries, Ltd., Dudley, is ensured by guide bars, which engage grooves in the sides of the rack.

Names of manufacturers of equipment mentioned are as follows:

Cheshire Engineering Co., Ltd., Stockport— 'Highway' borer; Conveyancer Fork Trucks, Ltd., Warrington— 2,000- and 3,000-lb reach trucks; Didsbury Engineering Co., Ltd., Manchester—'Minilift' hoist; Ford Motor Co., Ltd., Dagenham—diesel engines and tractors; Forge Craft, Ltd., Welwyn Garden City—trolley-mounted rope drum; Lyte Ladders, Ltd., Rogerstone—vehicle-mounted turntable ladder; Joel Olssons Elektriska A/B, Stockholm—pole-raising shearlegs; Prima Industries, Ltd., Dudley—cable-drum jacks; Salisbury Precision Engineering, Ltd., London —'Sherpa' VI and 1A stackers; Simon Engineering (Midlands), Ltd., Dudley—hydraulic working platform; H. C. Slingsby Ltd., London—television truck.



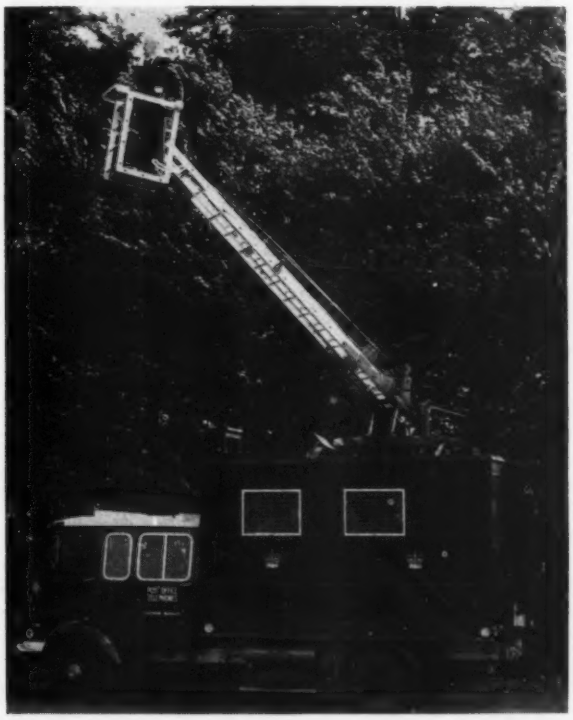
BELOW
Forge Craft drum in position for unwinding rope. Trolley handle is swung over for transportation



ABOVE
All movements can be controlled from working platform of this Simon hydraulically operated equipment. It is used for work on overhead cables, tree-cutting and pole renewal

LEFT
With aluminium-alloy bodies, these cable-drum jacks by Prima Industries, Ltd., Dudley, weigh 22 lb less than their malleable iron counterparts

BELOW
One-man working platform on turntable-mounted ladder by Lyte Ladders, Ltd., Rogerston



DEMONSTRATION

TRUCKS AND LOADERS FOR ECONOMIC HANDLING
Lister equipment on show in Manchester

By a Staff Reporter

A RANGE of auto-trucks, trailers and power loaders was demonstrated at Manchester recently during a 'Handling Economy Fortnight' organized by R. A. Lister & Co., Ltd., Dursley, Gloucestershire. The demonstration was staged at the premises of C. & A. Plant Services, Ltd., 212 Heald Grove, Manchester, authorized Lister dealers for the Manchester area.

A new Lister power loader was of special interest. This was the P.L.9 model, developed primarily for lorry loading and similar duties. It is similar to the earlier P.L.6 machine, but has a longer boom. Maximum delivery height is 9 ft, minimum delivery height being 4 ft. The model shown was complete with a 440 V 3-phase electric motor, fitted with reversing switch, and mounted on pneumatic-tyred wheels. The machine is illustrated in Fig. 1. In common with other Lister power loaders, it had a 2-ft wide conveyor track formed of slats bolted to a steel-link chain. Three types of track are available, the standard being fitted with 4-in wide slats having a gap between them of $2\frac{1}{4}$ in. For handling small objects, the space between the slats can be reduced by the insertion of a metal cross-bar leaving a $\frac{5}{8}$ in gap either side. Alternatively, 5-in wide slats with $1\frac{1}{4}$ in gaps can be used.

Fig. 1. The new Lister model P.L.9 power loader

Fig. 2. The Lister 'Multi-Level' loader

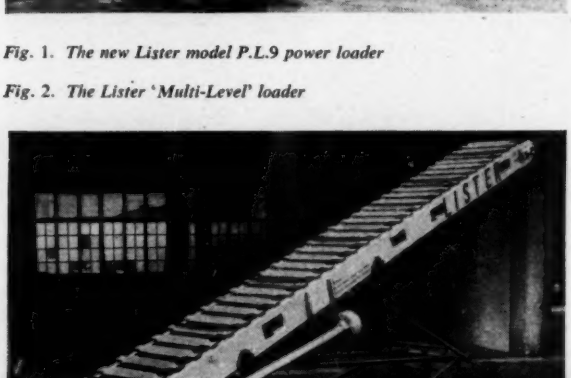


Fig. 3. The LDG truck with fixed platform, powered by a single-cylinder diesel engine developing $3\frac{1}{2}$ b.h.p. at 1,800 r.p.m.

Normal operating speed for the P.L.9 is 60 ft/min, the machine being suitable for all loads up to 2 cwts.

Other Lister power loaders on show were the P.L.12 and the 'Multi-Level' machine. The P.L.12 model may be powered by either electric motor or by petrol or diesel engine, the machine on show being equipped with a 400/440 V, 3-phase motor. This machine is able to deliver to a height of up to 12 ft (max), the minimum delivery height being 7 ft 3 in. Maximum load capacity is 4 cwts.

The Lister 'Multi-Level' power loader (Fig. 2) is an exceptionally versatile machine, permitting a very wide range of loading and unloading heights. From ground level, it will deliver to any height between 8 ft 3 in and 13 ft. Many other different loading and unloading heights can be arranged within the following limits; *loading height:* ground level up to 7 ft 6 in; *delivery height:* 6 ft up to 17 ft 6 in. Loads of up to 3 cwts can be carried.

A fuller description of the above-noted and other Lister power loaders will be published shortly in this journal under the series, 'Non-Fixed Conveyors and Elevators'.

Most of the auto-trucks on show were diesel powered by Lister single or twin-cylinder engines. One petrol truck was shown—a PHC/SS3, 1-ton elevating platform truck powered by a 600-c.c. petrol engine. This machine had a chequer plate platform measuring 6 ft 6 in × 39 in. Height of platform (lowered) was 13 in, the lift height being 5 in.

A useful truck for general factory duties was the LDG 2,000-lb diesel truck (Fig. 3) having a fixed platform fitted

Fig. 5. A CSA/LD2 tractor with TB articulated bolster trailer for carrying long loads

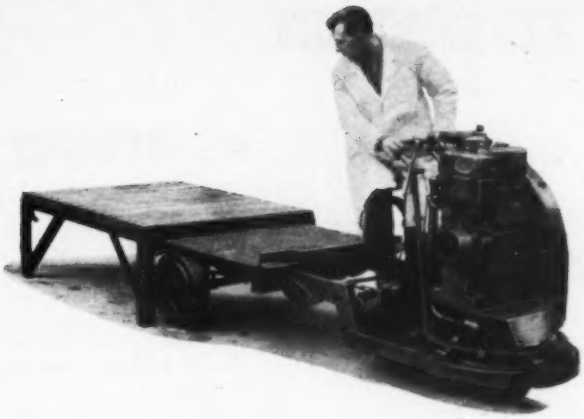


Fig. 6. An RHC/LD2 elevating platform truck of 2 tons capacity, together with a 2-ton stillage

Fig. 7. The diesel-powered NPS/LD2 universal tipping truck

Fig. 4. New type of van body based on an LDG Auto-Truck

with detachable side and end boards. This machine is powered by a single-cylinder Lister diesel engine of 3½ h.p. at 1,800 r.p.m. and has two forward speeds (3¾ m.p.h. and 7½ m.p.h.). The platform size is 6 ft 3 in × 3 ft 6 in, the height of the platform being 1 ft 5½ in. Turning radius of the LDG truck is 7 ft 4½ in.

Another inexpensive truck, based on the standard LDG machine just described, was fitted with a van-type body constructed from aluminium alloy panels on alloy framing (Fig 4). The van body was fitted with two rear doors and fixed windows in the sides. The roof was extended over the driver's seat as shown in our illustration. The power unit was enclosed in a non-standard engine cowl. This van body was designed chiefly for hospital work (e.g. for taking patients from wards to treatment rooms), but can be adapted to many other uses. The body can be fitted internally with racks or shelves as required.

For the transport of bar stock, tubes, timber and other long loads a TB 3-cwt articulated bolster trailer was shown operating in conjunction with a CSA/LD2 tractor. This combination is illustrated in Fig. 5. The tractor is fitted with a wedgeblock coupling which enables the towing bar of the trailer to ride up on the wedgeblock as the tractor is backed in beneath it, thus raising the front wheels of the trailer ready for moving off. Power is provided by a Lister LD2 twin-cylinder power unit of 7 b.h.p. at 1,800 r.p.m. The TB trailer has a 20-ft bolster pole, the rear carriage being adjustable to suit varying lengths of load.

The RHC/LD2 elevating platform truck (Fig. 6) is a diesel-powered machine of 2 tons capacity. As can be seen in the illustration, the machine was shown operating in conjunction with a suitable stillage. The platform is raised by means of a hand-operated hydraulic pump, though powered pump operation can be arranged if required. Lowered platform height is 22 in, the height of lift being 5 in. Size of platform is approximately 5 ft × 42 in. The power unit is the Lister LD2 7-b.h.p. twin-cylinder diesel engine.

Another interesting truck was the NPS/LD2 universal tipping truck. This has a 35-cu. ft. steel body capable of tipping in a wide radius. The tipping movement is hand operated as indicated in our photograph (Fig. 7). The unit is powered by the Lister LD2 diesel engine. A 17-cu. ft capacity version of this machine is also available.

In addition to the various machines described above there was on show an independent Lister diesel-engined LD2 power and steering unit which can be mounted in most Lister Auto-Truck chassis. This unit is now being fitted by many users when the time comes for their existing petrol-powered units to be replaced. The unit is the same as the LD2 equipment already described as being fitted to their latest Lister Auto-Trucks, and is of 7 b.h.p. at 1,800 r.p.m. Transmission is via a Lister gearbox giving two forward speeds and one reverse and with gear reduction drive to the road wheel. A pneumatic-tyred wheel is normally fitted, but a cushion tyre can be supplied as an alternative.

DEMONSTRATION

CRANES FOR THE OIL INDUSTRY

Demonstration at Sunderland

SENIOR EXECUTIVES from the oil and petroleum industries were guests of Steels Engineering Products, Ltd., during a recent demonstration of examples from the range of Coles cranes at Crown Works, Sunderland. The cranes shown were selected as being of particular interest to the oil industries. They were demonstrated in action, performing a wide variety of difficult tasks designed to illustrate their overall performance. The photographs reproduced on this page will give some indication of the types of performance test to which they were subjected.

A Coles S501 crane demonstrates its climbing and traction capabilities on a test gradient of 1 in 5

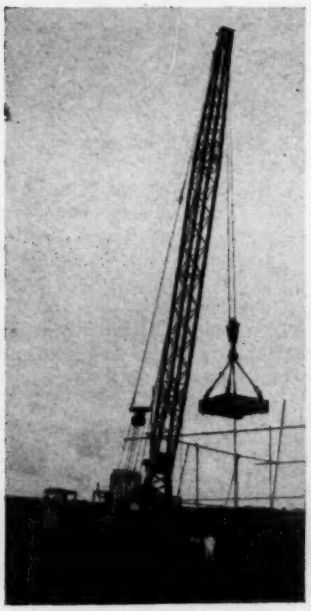
BELOW
A Coles L2310 'Dreadnought' oilfield crane simulates the positioning of an Ideal Rotary Table weighing 13,000 lb, on to an oil rig

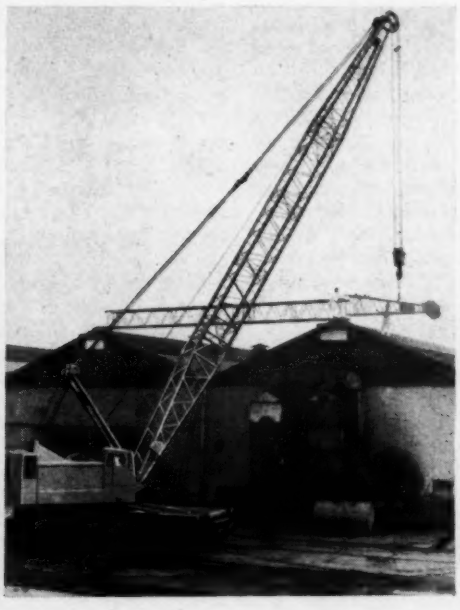
TOP
The Coles L1210 truck-mounted crane fitted with dual control system. This allows the chassis travelling, braking and steering to be controlled from the superstructure cockpit

ABOVE CENTRE
Here the Coles model S501 crane demonstrates the low headroom required by a cantilever jib crane with a load on the hook. There is only 12 ft headroom under the pipe assembly.

BELOW CENTRE
The largest self-propelled crane ever built in Europe—the Coles S5012—demonstrates its tremendous outreach and height of lift

BELOW RIGHT
A Coles fixed base crane—model S2310. It will lift 20 ton at 10 ft radius with a 30-ft strut jib





DEMONSTRATION

DEVELOPMENTS IN CONVEYOR BELTING

Report of a visit to the Speke, Liverpool, works of the Dunlop Rubber Company's Belting Division.

By a Staff Reporter

LATEST DEVELOPMENTS in Dunlop conveyor belting were on show during a recent visit of senior officers of the National Coal Board to the belting division of the Dunlop Rubber Co., Ltd., at Speke, Liverpool.

Evidence of an entirely new approach to conveyor belting was to be seen in the construction of a segmental belt which was on show for the first time. This belt promises to be a development of considerable importance, and we hope to be able to publish further details about it in an early issue of *Mechanical Handling*. In the meantime, a brief description of the belting can be given. Basically, it is made up of segments having close-fitting castellated joints at each end and held together by flexible tie-rods. Two short segments joined together in this way are illustrated in Fig. 1, while Fig. 2 shows a roll of belting assembled from identical segments. This construction enables segments to be replaced, or the length of belt adjusted, in a very short space of time. In addition, the belt has exceptional joint strength, stated to be at least 98 per cent of the actual belt strength.

This strength is achieved by steel cords laid in the belting. All the tension cords are in one plane and loop around the tie-rods, as indicated in Fig. 3. Transverse cords are wrapped around the tension cords and adjustments to the angle of wrapping predetermine the degree of lateral stiffness over a wide range. This system has been developed as an answer to the problem caused by belt joints being of much less strength than the belt itself, with consequent wastage of a large proportion of the belt strength. It is anticipated that despite the apparent complexity of the belt construction, real economies in belt weight and cost will be achieved by virtue of this greater utilization of the full belt strength, quite apart from the previously mentioned advantages of ease of repair and replacement.

Fig. 1. Two sections of the new Dunlop segmental conveyor belting joined by means of a transverse tie-rod

Fig. 2. A roll of assembled segmental belting

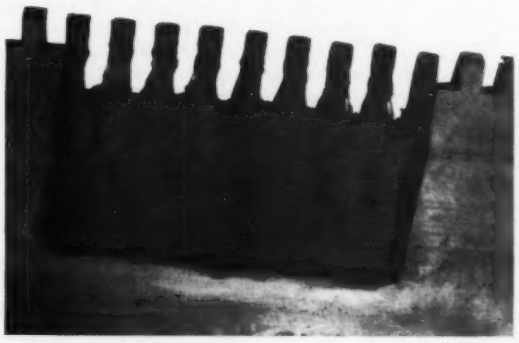


Fig. 3. This picture shows a close-up of the castellated edge of the segmental belting permitting the segments to be joined together by a tie-rod running through the preformed loops. The belting is cut away to show the transverse steel cords wrapped around the tension cords

Fig. 4. 'Building' a rubber conveyor belt by laying the various plies

Other examples of belting displayed included the Dunlop 'Star' range designed for specific service conditions. The latest of these is the 'Starfort' belt which is designed for exceptionally long hauls. With this new belt, it is claimed that tensile strengths of more than ten times those of a conventional belt can be achieved. Other belts in the 'Star' range are designed especially for applications requiring abrasion, impact, tearing or heat resistance. 'Starhete' belt, for example, is designed to operate under extreme temperature conditions in the range 250 to 350 deg F. There is also the established 'Stargrip' belting which has a specially designed grip-surface tread for package handling, etc., on inclines.

The range of belts available include those based on synthetic rubbers or plastics specially compounded to suit the properties required in the final product.

British Standards

In addition to the new belts described above, the company continues to manufacture a standard range of belts in

accordance with British Standard Specification No. 490. Special belts of varying types are also in production, the belting design section working in close co-operation with customers' project engineers. In particular, the Speke factory is producing the belting for the special type of conveyor patented by Cable Belt, Ltd. As is well known, this belt rests on two wire ropes which take the pull instead of the belt itself. Special equipment has been developed by Dunlop for the production of this belting.

The fabrics for incorporation in Dunlop conveyor belting are supplied from the company's own cotton mills. In this connection, a notable development has been the introduction of the patented 'Extron' fabrics which greatly increase the strength of belts while retaining their flexibility, troughability and general handling properties. These fabrics have, it is stated, enabled Dunlop to pioneer the development of heavy-duty long-haul belts which considerably reduce the number of transfer points where material has to be carried over long distances.

The Production Plant

The visitors to the Speke factory were able to see the ways in which the rubber and P.V.C. conveyor belts are manufactured. The fabric which goes into rubber belting is first 'frictioned' (i.e. rubberized) on a fully automatic unit which dips, dries and frictions the fabric at a rate of 120 ft/min. In the meantime, all rubber compound for the Belting Division is mixed in Banbury mixers.

The next stage is the 'building' of the conveyor belts prior to vulcanization. The various fabric-based plies are assembled on making tables, according to the specifications required. The preparation of the rubber cover of the desired thickness is then carried out on a calender machine.

Assembled belts are vulcanized under conditions of cure and stretch dependent on their construction and application, an average cure cycle being 15 minutes at 50 lb/sq. in. steam pressure at 297 deg F. Final inspection is carried out prior to packing and despatch.

P.V.C. Belting Manufacture

For the manufacture of P.V.C. belting, the polymers, plasticizers, stabilizers and pigment are mixed to a paste in mullers which provide a grinding action to ensure perfect dispersion. The paste is then pumped to storage tanks over the spreaders.

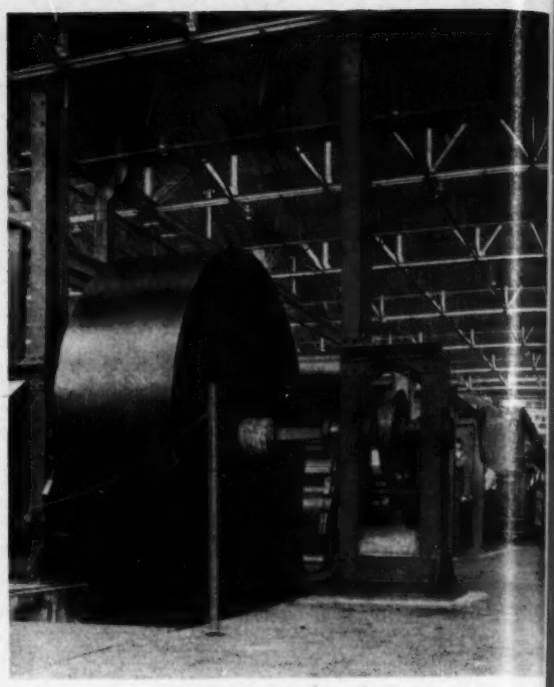


Fig. 5. This picture shows rubber conveyor belting in process of pressing

Prior to the application of the paste to the fabric, the latter is dried to a predetermined humidity in a hot-air dryer with automatic humidity control.

Spreader machines then apply the paste to the fabric which is accurately tensioned with an automatic electronic tensioning device. Tachometers ensure that the correct speed is maintained.

Up to seven plies of material can then be consolidated and processed on a continuous Spooner/Rotocure unit. Automatic pre-set tension rollers ensure that all plies are processed under the same tension. Special guides ensure the correct line-up of the various plies.

The Spooner unit is thermostatically controlled to a pre-set temperature. Here, full gellation of the P.V.C. compound takes place. The subsequent Rotocure unit consolidates the fully-gelled plies and ensures adequate adhesion between them.

A trimming table splits the consolidated belt to the desired widths, and these are then edged with an extruded edging material.

After inspection of the Speke factory many of the visitors attended a joint meeting of the Institution of the Rubber Industry and the Plastics Institute, at Liverpool. A brief abstract from two papers read at the meeting appears on pages 58-59 of this issue under the heading 'Flameproof Conveyor Belting'.

Fig. 6. Pressing of P.V.C. belting in the Rotocure

NEWS OF PERSONALITIES

Materials Handling Equipment (Great Britain), Ltd., announce that **John F. Whitfield,** general manager of the company, has been appointed a director. Mr. Whitfield has considerable experience of export markets and his knowledge of French, German and Russian languages has proved a great advantage.

J. F. Thomas and **Commander E. G. Sutton, R.N. (Retd.),** have been appointed Directors of John Thompson (Wolverhampton), Ltd.

Arnold Carr, assistant managing director of Thos. W. Ward, Ltd., Albion Works, Sheffield, has been appointed deputy chairman of the company.

Mr. Carr who lives in Fulwood Road, Sheffield, joined Thos. W. Ward, Ltd., in 1915 as a commercial apprentice. He was later attached to the foundry supplies department becoming a junior representative in London. He was appointed local director in 1936 and was elected a director in 1941, becoming resident London director in 1941. He returned to head office as assistant managing director in January 1954.

Mr. Carr is also chairman and director of a number of companies of the Ward Group at home and abroad.

Also announced is the appointment of **Douglas F. Walton** of Chorley Road, Sheffield, as a director of Thos. W. Ward, Ltd. Mr. Walton has worked in the Railway Sidings Department for many years, becoming a local director of the company in 1948. He has been in charge of this department since the retirement of Joseph Walton in 1955.

Mr. Walton is also a director of The Ketton Portland Cement Co., Ltd., Darlington Railway Plant & Foundry Co., Ltd., and Railway & General Engineering Co., Ltd.

Leslie Ingham, formerly manager of the industrial sales division, has been appointed assistant sales manager of Chloride Batteries, Ltd., of Grosvenor Gardens House, Grosvenor Gardens, London, S.W.1, for the sales of all types of batteries in the United Kingdom and overseas.

Holder of the first prize and silver medal in electrical installation awarded by the City and Guilds Institute, he is also an associate member of the Institution of Electrical Engineers, a member of the Association of Mining, Electrical and Mechanical Engineers, and has been awarded the Electrical Development Association Sales Engineers' Diploma.

W. C. West has now been appointed chief European representative for J. C. Bamford (Excavators), Ltd., Rocester, Staffordshire, England. The territory covered by him is Finland, Sweden, Norway, Denmark, Holland, Germany, Austria, Belgium, Luxembourg, France, Switzerland, Spain, Portugal, Italy, Greece and Yugoslavia. His main purpose will be to give sales, technical and publicity liaison between all agents and customers in Europe and in the company in England.

John F. Whitfield

L. Ingham

W. D. Cartwright

W. C. West

Steels Engineering Products, Ltd., the Sunderland manufacturers of Coles cranes, have appointed **W. D. Cartwright** as field sales executive. He will be attached to the staff of the home sales director at Sloane Street, London, S.W.1. Prior to this appointment, Mr. Cartwright was with R. A. Lister & Co., Ltd., of Dursley, Gloucestershire, for eight years, and was for five years sales manager of their auto-truck division.

Steels Engineering Products, Ltd., also announce the appointment of **C. E. Drew** as an overseas sales executive. He will be attached to the Export Sales Department at Berkeley Street, London, W.1. Prior to this appointment Mr. Drew was for 10 years, an area technical representative for I.T.D., Ltd., of Birmingham and has wide engineering and materials handling experience.

Handy Angle, Ltd., announce that **A. F. Alvers** has been appointed assistant home sales manager. Mr. Alvers, who was previously northern divisional sales manager, joined the company as a representative in 1954. In 1957 he toured the U.S.A., where he was responsible for training representatives in the selling methods to be adopted in that country.

H. N. Adams has been appointed to succeed the late W. N. McCann as Branch manager of Silvertown Rubber Co., Ltd., at Broughton Bridge, Blackfriars Road, Manchester 3.

OBITUARY

We regret to report the death of **T. V. Redston,** chairman and founder of the Mercury Truck & Tractor Co., Ltd., who passed away in his sleep.

T. V. Redston

Born at Stroud, Gloucestershire, September 13th, 1888, he was educated at Merchant Venturers' Technical College, Bristol, and later at the University of Bristol.

From 1919 undertook representation of several American companies including that of Service Recorder Company of Cleveland, Ohio, and subsequently founded Servis Recorder Co., Ltd., and Mercury Truck & Tractor Co., Ltd. He was chairman of both companies at the time of his death.

Mr. Redston was an active member of the Industrial Truck Manufacturers' Association and a founder member of the Institute of Materials Handling.

He had numerous other activities. Was a Freeman of the City of London, a Liveryman of the Clockmakers' Company and of the Woolmen's Company; was M.F.H. of the Cotswold Vale Farmers' Hunt 1951/1954. He was also extremely interested in show jumping and racing, was vice-president of the Cheltenham Horse Show Society and a member of the Cheltenham Steeplechase Club.

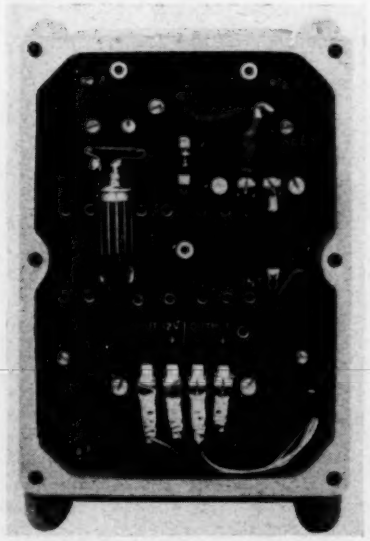
REVIEW OF NEW EQUIPMENT

TRANSISTORIZED LEVEL CONTROLLER

Since they introduced the capacitance level switch in 1946, Fielden Electronics, Ltd., Wythenshawe, Manchester, have pursued a policy of continuous improvement which has led to the recent appearance of the Tektor T.T.5 transistorized capacity level controller. Of revolutionary design, this instrument gives the circuit exceptional long-term stability for difficult applications. Among its outstanding features is stability of the highest order against supply variations of plus-minus 15 per cent and temperature variations of up to 50 deg C. With 12-V D.C. operation, it is simple and inexpensive to install, and as it can be operated off any normal 12-V battery, it is suitable for mobile applications, such as road tankers, ships, etc. Adjustment is foolproof, an indicator lamp being built in for setting up a Set-Run switch, and with triggered relay action, capacity differential is completely independent of electrode capacity. Provision can also be made for the unit to be operated off 230 V A.C. through a mains converter if desired.

Housed in a small gasketed weatherproof case, the instrument is safe to handle by unskilled personnel. Its use means no moving parts inside the containers, there is nothing to get clogged or requiie adjustment, and it can be used on all liquids or free-flowing solids regardless of conductivity, insulating value, density, corrosive properties or various process conditions. An extensive range of electrodes has been developed to meet every conceivable application.

Internal view of the Tektor T.T.5 level controller

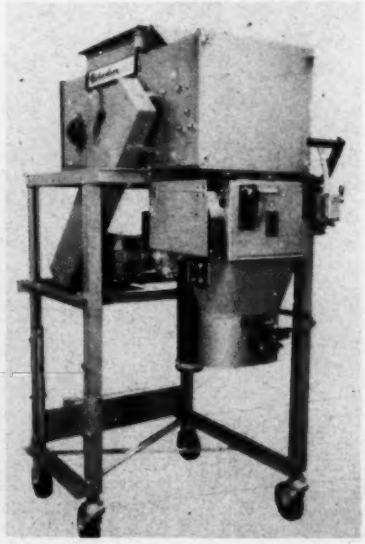


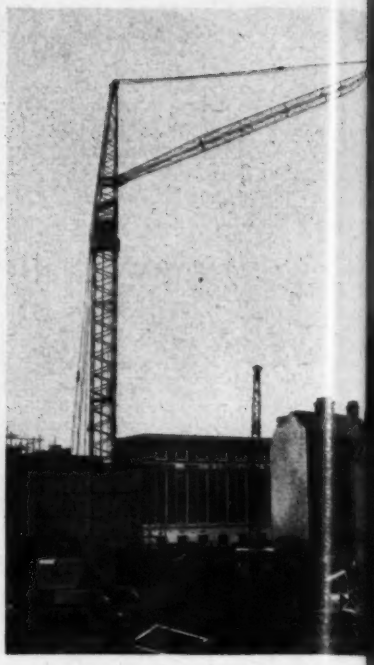
GROSS BAGGING SCALE

To meet the needs of small plants for an inexpensive one-man gross bagging scale with feeder the new GA-17 unit has been developed in America by the Richardson Scale Co., Clifton, N.J., whose products are made in this country by the Richardson Scale Co., Ltd., Albert Street, Bulwell, Nottingham. It features an eye-level visual balance indicator which operates on the torsion principle so that indication is rapid, accurate and stable, permitting on-the-spot elimination of weighing errors. With this scale, the bagging of pellets, dairy feeds, meals, mash feeds, chemicals, peanuts, beans, powders, flakes and other non-free-flowing materials is done at both low initial and operating costs. It is available in stainless steel for the handling of fertilizers.

Designed for use with open-mouth textile and multi-wall paper bags, the GA-17 provides accurate filling of 10 to 140 lb bags. The weigh beam indicator is marked off in easy-to read numerals and informs the operator at a glance the accurate balance of the beam. The scale requires only minimum headroom. When the bag is slipped on an oval spout, it is held by a Camgrip holder. The operator pulls the gate handle, which opens the scale inlet gate and starts a belt feeder. When the weigh beam comes to balance, the scale inlet closes and the feeder stops. The visual balance indicator now shows true balance. The Camgrip holder provides a quick release of the filled bag. Other features are: compensation arrangement which automatically cuts off the scale at accurate weight; slide attachment to permit serving many spouts; large handhold for observation and access; sturdy but simple construction; and scale easily detachable from feeder.

The Richardson GA-17 gross bagging scale with feeder





A Buildmaster 42 tower crane at work on the new Birmingham ring road

NEW RANGE OF TOWER CRANES

A new rotary crane, the Buildmaster 42, the first of a new range produced by Abelson & Co. (Engineers), Ltd., Coventry Road, Sheldon, Birmingham, 26, incorporates a number of new features and all the latest developments and refinements in tower crane design and technique. Having a higher mast and longer jib mounted on a polypus travelling carriage, double-angle box-section, tubular-braced mast and jib and an increased working range, it is intended in due course completely to supersede the Buildmaster 360 from which it was developed.

A more streamlined appearance to the carriage and superstructure is one of the outward features of the whole of this new range, details of which are given in the Table in page 51.

A much simplified square spigot and fishplate mast-jointing system ensures quick and easy alignment of the sections, and cuts down the assembly time. The double-angle square box-section mast and jib corner members and tubular bracings impart the greatest possible strength for the lowest possible projected wind surface

Details of the new Buildmaster range of Tower Cranes

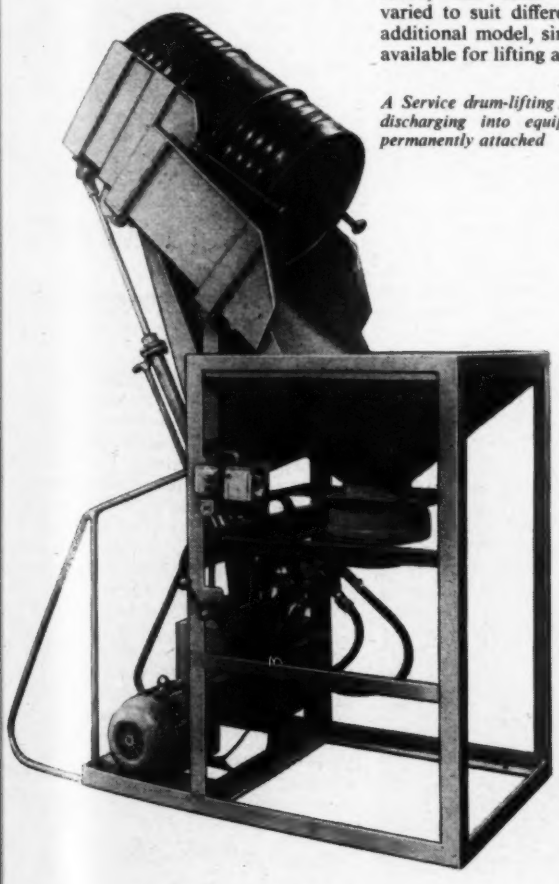
	Model 52	Model 42	Model 29	Model 17
Height of mast to fulcrum point	103 ft 0 in	95 ft 2 in	79 ft 0 in	58 ft 3 in
Length of jib	98 ft 0 in	87 ft 3 in	72 ft 3 in	59 ft 0 in
Maximum height of lift	195 ft 6 in	178 ft 0 in	143 ft 6 in	115 ft 0 in
Maximum load				
with long jib	4 tons	3½ tons	3 tons	12 cwt
with short jib	5 tons	4 tons	3 tons 5 cwt	15 cwt
Gross weight (approx)	58 tons	44 tons	30 tons	17½ tons

area, thereby making the crane less subject to adverse wind conditions.

DRUM LIFTING AND DISCHARGING MACHINE

An electrically driven and hydraulically operated machine for quickly raising drums and discharging their contents has recently been added to the range of mechanical equipment manufactured by the Service Engineering Co. (Northampton), Ltd., Weedon Road, Northampton. It is designed to be positioned close to equipment into which goods are being discharged, or can be permanently secured to it. Alternatively, the whole machine can be mounted on wheels or rails for loading any number of hoppers in close proximity to each other. The independent model comprises an angle iron frame with sheet metal sides on one of which the control panel is mounted. To the vertical back of the machine are pivoted two hydraulic rams and a lifting arm carrying a discharge chute. One ram raises the lifting arm and the other actuates the drum carrier which is also pivoted to the lifting arm. By this arrangement the carrier is raised from ground level, with the drum in the vertical position until at maximum height it is tilted on to the downward sloping chute to discharge the load. Hydraulic power is exerted by a flange-mounted Mackaness pump driven by a 400–440-V 3-phase, totally enclosed, fan-cooled 2½-h.p. electric motor. The main bearings are of the Pollard self-lubricating and Timken pre-packed type, reducing maintenance to a minimum.

The lifting capacity is 5 cwt, and three models are supplied with discharge heights of 4 ft, 5 ft or 6 ft above ground level. The unit measures 6 × 3 ft wide and offers approximately 9 ft 6 in headroom, but these dimensions can be varied to suit different applications. An additional model, similar in operation, is available for lifting and discharging sacks.



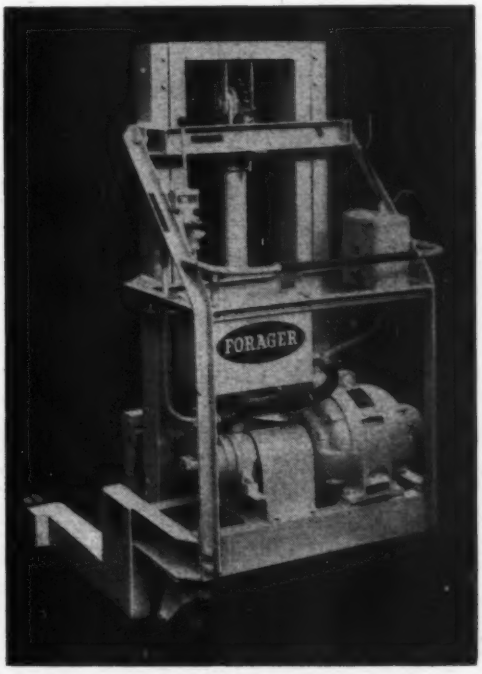
A Service drum-lifting machine in position for discharging into equipment to which it is permanently attached

HAND- AND POWER-OPERATED STACKERS

Two new Forager stackers, hand- and power-operated, have been recently produced by A. Hirst & Son, Ltd., Crescent Works, Meadow Lane, Dewsbury. Both are constructed from heavy-section steel channel, tube and plate.

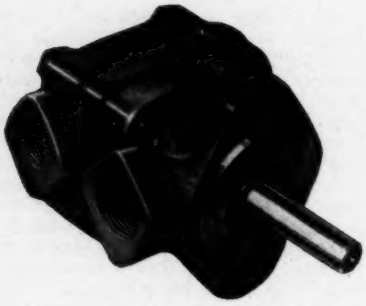
Of 1,120 lb lifting capacity at 18 in centres, the hand-operated model is carried on three 8 in × 2 in solid iron or rubber-tyred wheels fitted with roller bearings, the single steering wheel and tiller assembly being carried on taper roller bearings. To reduce friction to a minimum, the lifting carriage is fitted with sealed ball bearing rollers and centre guide channel. The 3 × 1½ in forks are 30 in long and are raised hydraulically 5 ft by a three-speed hand pump to give a quick lift for light loads. The overall length, with 30-in forks, is 4 ft 6 in, width 3 ft 8 in, height, 7 ft, height of straddle arms, 9 in, and width inside straddle arms, 3 ft 2 in.

Of the same capacity, the power-operated model has four solid iron or rubber-tyred wheels, the two front wheels 6 in and the rear wheels 8 in in dia. The 3 × 1½ × 30 in long forks are adjustable from 3 to 20 in centres. Lifting power is obtained by a 2-h.p. single- or three-phase electric motor driving a hydraulic pump, with a three-position control valve, giving raise, hold and lower positions, and built-in relief valve. The lifting speed is 35 ft/min and lowering speed 25 ft/min. With 9 ft 6 in as standard, the lifting height ranges from 6 ft 6 in to 12 ft. The



Rear view of the Forager 10-cwt powered stacker, showing positions of the electric motor and controls

overall length, with 30-in forks, is 4 ft 8 in, width, 3 ft 10 in, lowered height with 9 ft 6 in lift, 6 ft 5 in, height of straddle arms, 6 in and width inside straddle arms, 3 ft 2 in. The unladen weight is approximately 9 cwt.



A new V200 Series Vickers-Detroit hydraulic vane-type pump

FOUR-WHEEL DRIVE DUMPER

The latest Douglas four-wheel drive chassis is now available with a short wheelbase of 9 ft 6 in, fitted with a dumper body of 6 to 8 cu. yd. that is tipped to 75 deg in 9 sec. It has a high-speed Rootes Lister horizontal three-cylinder diesel engine, developing 105 b.h.p. at 2,400 r.p.m., a 4-speed and reverse synchromesh main gearbox and 2-speed auxiliary box, providing eight forward and two reverse speeds, standard Douglas fully floating front and rear drive axles, cam and double-roller steering gear, air-pressure brakes, hydraulically applied to the front axle, and mechanical handbrake. The forward control cab is of all-steel construction, and the body floor is of the sandwich type with top sheet plate bolted for easy renewal. With a gross weight of 16 tons and 85 per efficiency, the maximum speed is 40 m.p.h., tractive effort, 15,560 lb, minimum speed at maximum torque, 1·4 m.p.h. and the machine will climb a maximum gradient of 1 in 2·5. Alternative diesel or petrol engines are available. The manufacturers are Douglas Equipment, Ltd., Kingsditch Lane, Tewkesbury Road, Cheltenham.

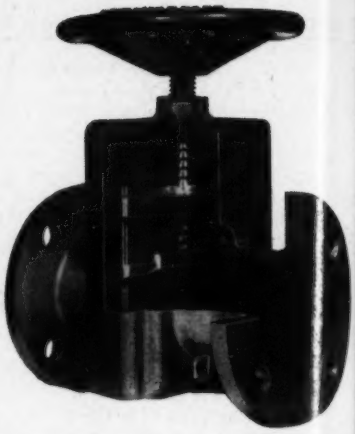
The latest Douglas four-wheel-driven dumper fitted with a concrete dump body

REVISED VANE-TYPE PUMPS

The introduction of a revised Series V200 of Vickers-Detroit vane-type pumps for the oil hydraulic actuation of movements in handling and constructional machinery is announced by Stein Atkinson Vickers Hydraulics, Ltd., 197 Knightsbridge, London, S.W.7. These have been re-designed internally for working pressures up to 2,000 p.s.i., and drive speeds up to 2,000 r.p.m. increased performance being obtained at reduced cost. The new pumps, which are externally identical with the earlier V200 Series, are available with any of four ring sizes, giving approximate displacement of 1, 3, 5 and 7 g.p.m. per 1,000 r.p.m. They can be applied with pump head incorporating relief and flow restrictor valves suitable for power-assisted steering applications.

INDUSTRIAL PINCH VALVES

A new range of industrial pinch valves of 1 to 3 in bore dia, designed for quantity low-cost production, has been introduced by W. H. Rowe & Son, Ltd., Quayside Road, Southampton. The die-cast aluminium alloy casing, with specially designed reinforced sleeves, is split vertically for ease of assembly and servicing, and has end flanges to B.S. Specification Table D. The closing mechanism consists of two die-cast aluminium alloy anvils, screwed spindle and handwheel to compress the sleeve equally from both sides. The spindle has two right-hand threaded portions, the lower thread twice the pitch of the upper one. The upper thread engages in a nut held in recesses in the half-casings, while the coarse thread engages with the rising bridge connected by two rods to the lower anvil. When the handwheel is turned to close the valve, it drops towards the top of the casing by a distance equal to half of the valve bore, providing external indication of its position. At the same time the coarse thread causes the bridge and lower anvil to rise by a similar amount to pinch the sleeve equally about its centre line.



A Rowe 2-in pinch valve with casing cut away to show the rubber sleeve and closing mechanism

Reinforced sleeves of natural or synthetic rubber are available in four grades for general purpose duties, alcohol and milk, petroleum products, tar and ammonical liquors and abrasive materials. Of these the second has been specially compounded to withstand repeated steam scalding where food products are being handled.

FEBRUARY

The above issue will contain, amongst others, the following articles:—

Handling in the Factory of the Future

Public Works Exhibition Report —Part II

and usual features

TRADE NOTES

Maintenance and Repair Service for Industrial Trucks

A round-the-clock, 7-day week, emergency breakdown service plus a full preventive maintenance programme for industrial truck users is now provided by Downtime, Ltd., 61 Court Farm Road, Mottingham, London, S.E.9. (Telephone: Eltham 3222.)

The company is led by Mr. C. S. Lewis who, until recently, was a senior service engineer for Lansing Bagnall, Ltd. On a contract basis, regular inspections of equipment are carried out by a visiting service engineer, with the result that a high proportion of the more serious type of breakdown can be avoided because of the early detection of trouble symptoms. If and when breakdowns do occur, at whatever time of the day or night, the company's repair service immediately comes into action to put the matter right without delay.

(*continued on page* 53)

Hotel Service for Overseas Visitors

Firms who are faced, from time to time, with the need to arrange hotel accommodation in London for overseas guests are invited to make use of the London Hotels Information Service, 88 Brook Street, London, W.1. (Telephone: Mayfair 5[illegible]4.)

This service is for overseas visitors only, and is entirely free of charge to visitors and hotels alike. Private individuals, associations, clubs and business houses in this country or anywhere in the world are entitled to make full use of the service to obtain hotel accommodation in London for overseas visitors who have already arrived in this country, or who are planning a visit.

Mining Machinery Exhibition

An exhibition of mining machinery and ancillary equipment will be held at Grand Hall, Olympia, London, from July 9th to 18th, 1959, it is announced by the Council of Underground Machinery Manufacturers. Further details will be published later

Mechanized Malting Plant

Malting all the year round, independent of weather conditions, is possible in the new box drum malting plant built by Bass at Shobnall, near Burton-on-Trent.

By traditional methods, malting can only be undertaken during the eight colder months of the year.

Opening the new plant recently, Lord Gretton, a director of Bass Ratcliff & Gretton, Ltd., said it was the largest of its type in the world.

Costing nearly three-quarters of a million pounds, the plant is fully automated and gives the maltster finger-tip control over the whole process. Hygiene—so essential in the preparation of beer—is ensured at the new plant by completely mechanical handling and processing. The grain is untouched by hand.

The plant was built by Robert Boby, Ltd., and its erection in the building closely supervised by Lord Gretton who has taken a keen interest in the design of the plant from the beginning.

Metropolitan-Vickers' London Offices

Metropolitan-Vickers Electrical Co., Ltd., district office and special contracts and traction sales departments and Metropolitan-Vickers Electrical Export Co., Ltd., have moved to 33 Grosvenor Place, London, S.W.1. (Telephone: Belgravia 7011.)

British Thomson-Houston Co., Ltd.

The London district office of The British Thomson-Houston Co., Ltd. (Manager, Mr. J. L. Dixon), is now located at 33 Grosvenor Place, London, S.W.1. and not at Crown House, Aldwych. The British Thomson-Houston Export Co. (Managing Director, Mr. E. V. Small) is already established at the new address. The telephone number at 33 Grosvenor Place is Belgravia 7011.

New Wine Bottling Plant

An automatic bottling plant with a capacity of 1,800 bottles of wine an hour has been installed by S. F. & O. Hallgarten at their cellars in Stainer Street, London, S.E.1. The plant carries out the three main operations of sterilizing, filling and corking.

Modernization has also been extended to loading and unloading of transport vehicles. For this purpose a Yale pedestrian-controlled fork lift truck is used which, among other duties, unloads incoming casks from the van and transfers them rapidly to scantling. Alternatively, the wines are pumped over from the casks on the van direct to storage tanks. The unloading of new bottles coming in can be handled by one man with the fork lift truck at the rate of 40 dozen a time; and the same applies to outgoing goods.

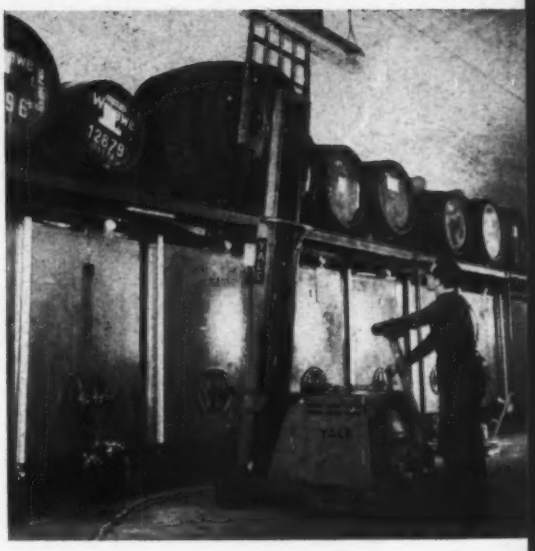
Automatic Welding

The British Welding Research Association is undertaking the latest cover-to-cover translation from the Russian. Regular translation of 'Avtomaticheskaya Svarka' (Automatic Welding) will start with the January, 1959, number which is expected to arrive in Britain in March, and to be distributed in translation to subscribers in May or late April.

'Avtomaticheskaya Svarka' is the only monthly journal in any language with the title 'Automatic Welding' though it is fair to say that the title is not absolutely descriptive except in so far as manual techniques are not emphasized. Equipment and methods of welding are dealt with, as well as metallurgy, the strength of welded work generally and fatigue testing.

The D.S.I.R. translation programme is planned in conjunction with a similar programme in the U.S.A. so that the two shall not overlap and the maximum of information will thus become available in English. B.W.R.A. has arranged for the August 1958 number to be translated as a specimen and this will shortly be available on loan to anyone who writes to the Association at 29 Park Crescent. The subscription price will be £10 10s. for the 12 issues of 1959.

This machine stacks the dried raw bricks emerging from the drying furnace on the tunnel-kiln trolleys at the brickworks at Ilända, Sweden



The Yale pedestrian-controlled fork lift truck at S. F. & O. Hallgarten's cellars is seen here stacking a half-stueck containing 135 gal of wine

New Branch Offices

Martonair, Ltd., manufacturers of pneumatic equipment, announce the opening of two new branch offices.

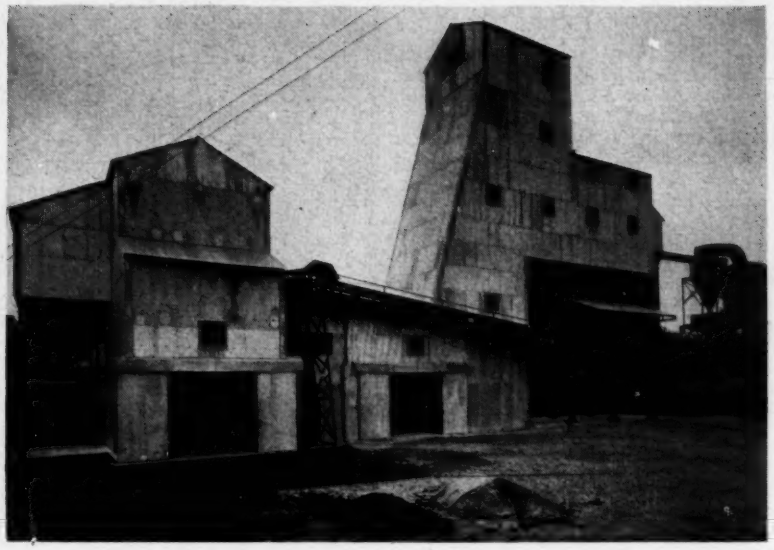
An attractive office and stockroom has been established at the modern Central Administration Building, Team Valley, Gateshead, 11. Mr. C. P. White, the technical representative for the North-East, will operate from this office.

In Birmingham, a showroom, stockroom and office at 46 Great Hampton Street replace the offices in Holyhead Road. Mr. R. A. Young remains office manager and the telephone number (Northern 7273) is unchanged.

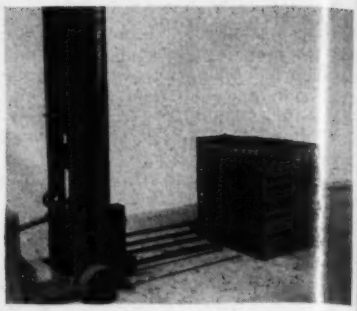
New Swedish Brickworks is Fully Automatized

A rebuilt, fully automatized brickworks, planned and constructed in Sweden, has recently started functioning at Ilända, near Stockholm. Substantial economies have been made in man-hours and the annual capacity has been increased by one-half. Drying requires 48 hours instead of ten times that period previously, and firing takes place in 37 hours instead of 16 days.

Not a single brick is touched by hand and even the drying laths are laid automatically and removed automatically before the brick load passes into the firing kiln. An oil-fired tunnel kiln with automatic temperature control gives the bricks a uniform quality. An interesting feature of the mechanical handling system for the bricks is the new transfer machine, which stacks the dried raw-bricks emerging from the drying furnace on the tunnel-kiln trolleys, and which has been con-



This new crushing and screening plant, which provides material for Salop County Council's roads, has recently begun production at Nills Hill Quarry, Pontesbury, near Shrewsbury. In a few months' time it will have an output of between 800 and 1,000 tons a week. The plant was built by Frederick Parker, Ltd., of Leicester



ABOVE
Crate-handling attachment: In response to a customer's request, Lansing Bagnall, Ltd., of Basingstoke, have developed a special multi-prong fork carriage which permits the crates to be handled by fork lift truck without the need for pallets. The attachment, seen above, is stated to be readily adaptable for all the common forms of crate now in use. It was developed as part of the company's materials handling consultancy service for industry

RIGHT
Dutch Cranes Use British Engines: These three mobile 'Elephant' cranes, made by Thole N.V. of Enschede, Holland, are fitted with British-made 3-cylinder Perkins P3(1) industrial diesel engines

structed by the Swedish engineer Erik Drakenberg, working for AB Malardalens Tagelbrk. It is believed that the Ilända works is the most modern and most fully automatized of its kind in the world.

Films shown by George Cohen Sons & Co., Ltd.

'Plant for the Municipal Engineer and Public Works Contractor' was the theme of a film show organized by George Cohen Sons & Co., Ltd., in conjunction with the recent Public Works and Municipal Services Congress and Exhibition at Olympia.

Three films, introduced by Mr. Percy R. Levy, a director of The George Cohen 600 Group, were shown to an audience of 200 engineers, surveyors, building, civil engineering and public works contractors and plant managers. They were entitled: *Meet the Ten-Ten, A Load Off Your Mind* and *The Pingon Tower Crane*.

The Contractors' plant department of George Cohen Sons & Co., Ltd., have recently been appointed sole agents in the United Kingdom for the range of Pingon Tower and Climbing Cranes. The principal of the French manufacturers, M. Tichauer, attended the film show. The Pingon range comprises six models, all of which are of the horizontal saddle jib type which allows vertical and horizontal handling of loads and complete coverage of the working area. This film dealt with the erection of two models—the P.15 and the P.45, the former in the medium-capacity class and the latter being a heavier type of machine.

The second film, *A Load Off Your Mind*, is about the HIAB Lorry Loader. In the film Sheffield Corporation Street Lighting Department's HIAB was shown working on that authority's current street lighting programme. Other sequences showed a HIAB owned by the Wales Gas Board laying gas mains in Cardiff. Although not illustrated in the film, packaged brick handling is another application of the versatile HIAB and, at a recent demonstration in Plymouth, a 2-ton capacity machine discharged seven tons of bricks, palletized into 1-ton loads, in under nine minutes. George Cohen Sons & Co., Ltd., hold sole agency in the United Kingdom for the 2-ton HIAB Lorry Loader.

The third film, *Meet the Ten-Ten*, as its title implies, introduces the Jones KL 10-10 'Fast-Travel' Mobile Crane which, unlike the conventional lorry-mounted crane, employs but one engine only to power both the travelling and the crane motions. The KL 10-10 is rated at 7 tons free-on-wheels and 10 tons on outriggers working on a 30-ft lattice strut or cantilever jib. Lift heights of up to 100 ft can be attained.

Flying visit to Caterpillar Tractor Co., Ltd., Glasgow

Fifty-five leading industrialists and personalities from British construction industry, including plant hire contractors and public authorities, flew to Glasgow in a chartered Viscount aircraft of British European Airways recently to tour the new tractor plant of Caterpillar Tractor Co., Ltd.

This visit was organized by Fred Myers, Ltd., Caterpillar dealer for the London area and southern England. During their tour of Caterpillar's 600,000 sq. ft of Glasgow plant, the party saw work in progress on the assembly of Caterpillar D8 crawler tractors.

The tractor assembly line aroused considerable interest being of the ground level conveyor type with mounted stands along which the framework moves through its various substations until the completed tractor emerges at the end.

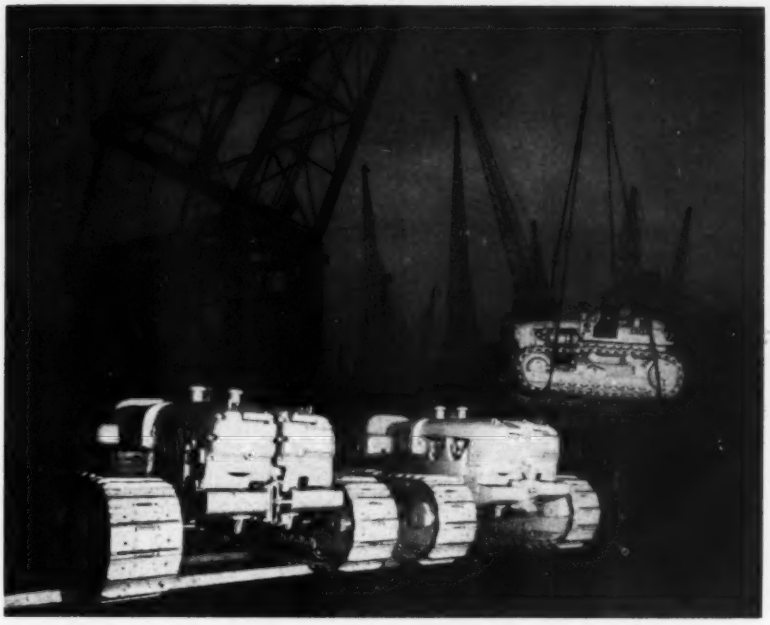
Sahlin Iron Hand will be Manufactured in U.K.

Sahlin Engineering Company, Inc., Birmingham, Michigan, U.S.A., has announced formation of a British subsidiary, Sahlin Engineering Co., Ltd. With offices located at 87a Hobs Moat Road, Solihull, Warwickshire, the new company will handle manufacture and sale of the Sahlin Iron Hand, a machine for automatically handling pressed metal stampings, as well as related automation equipment for the metal forming industry.

The British company will be staffed by experienced engineers under the direction of Mr. Edward L. Rohl, formerly chief engineer of the American company.

(*continued on page 59*)

RIGHT
Euclid TC-12's are shown being unloaded at Liverpool before delivery by Blackwood Hodge to the Sir John Jackson & Co., Ltd., contract at the Carway open cast coal site in South Wales. The units, which weigh 67,800 lb each and are of 402 h.p., are stated to be the largest and most powerful crawler tractors in the world. They will be used in the restoration of the Carway site

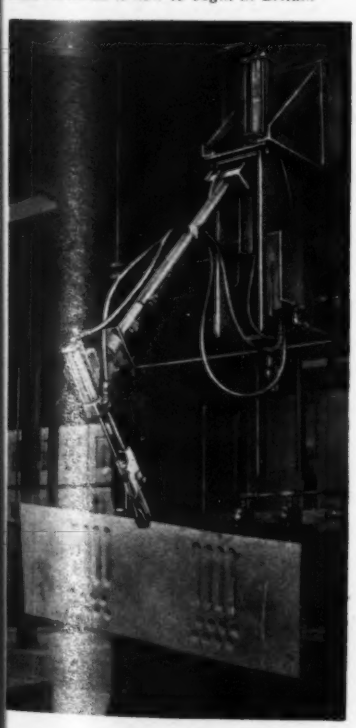


Mr. Richard T. Sahlin, president of the Michigan firm which originated the Iron Hand and related parts handling equipment, said that his company has already installed batteries of Iron Hands and other equipment in practically all large automobile and other sheet metal stamping plants throughout the world.

The formation of the new British subsidiary was necessary, he said, because production in Europe, and particularly in the U.K., is rapidly approaching that of the United States, and therefore there is a real need for automatic equipment such as Sahlin manufactures. A number of Sahlin Iron Hands purchased direct from U.S.A. were already installed in British factories and the new arrangement would not only facilitate earlier delivery but in addition would enable the equipment to be purchased for sterling. By having on-the-spot technical engineers a service equivalent to that obtained in the U.S.A. would be possible.

The Iron Hand will be available in various standard sizes. It is a self-contained, fully automatic machine for unloading operations and is capable of numerous adjustments which can be made quickly and easily for unloading parts of all shapes and sizes.

A typical Sahlin Iron Hand. Production of these machines is now to begin in Britain



PUBLICATIONS RECEIVED

Herbert Morris, Ltd.
Morris mechanical handling equipment of all kinds is the subject of a new illustrated publication (Book 237) from the above company, of Loughborough.

Edge & Sons, Ltd.
A new catalogue dealing with wire ropes, chains and the fittings associated with these products has been issued by Edge & Sons, Ltd., Shifnal, Shropshire.

Dewhurst & Partner, Ltd.
The above company, of Inverness Works, Hounslow, Middlesex, have issued a brochure dealing with their new range of remote-control push-button equipment. The range consists of a large number of different standard components which can be combined to make an almost infinite number of assemblies.

Chaseside Engineering Co., Ltd.
Two new brochures, one dealing with the Loadmaster 3000 loading shovel, the other with the Chaseside Hi-Speed dumper, are available from the above manufacturers, of Station Works, Hertford.

Londex, Ltd.
The latest 44-page data book for 1959, including many new items, is now available from the above company, of Anerley Works, 207 Anerley Road, London, S.E.20, manufacturers of electrical remote-control equipment.

Metal Formations, Ltd.
Chutes, storage hoppers, stillages, trucks and trolleys are among the equipment illustrated in a new publication giving a general survey of the products of Metal Formations, Ltd., of Regent Works, Woodsetton, Dudley.

J. W. Teale, Ltd.
A wide range of conveyors, elevators, bunkers and other handling plant is illustrated in a new publication from J. W. Teale, Ltd., Oldcotes, Nr. Worksop, Notts.

Ransomes & Rapier, Ltd.
The above company, of Ipswich, have issued three new leaflets dealing with truck-mounted concrete mixers as follows: (1) Horizontal Drum Truck Mixers and Agitators; (2) High Discharge Truck Mixers and Agitators; and (3) Tilting Agitators.

Rossendale Chain and Block Co., Ltd.
Electric hoists are the subject of new leaflets from the above company, of Vine Grove Testing Works, Haslingden, Lancs.

Pollard Bearings, Ltd.
This company, of Ferrybridge, Knottingley, Yorks, have issued a new Pollard 'Max-Load' high-capacity roller bearings catalogue.

Uses of Magnesium
The Magnesium Industry Council, Dickens House, 15 Took's Court, London, E.C.4, has published an attractively produced booklet dealing with the properties and uses of magnesium and its alloys.

Isopad, Ltd.
A new catalogue dealing with Isomantle electric surface heating for process vessels, pipelines, etc., has been issued by Isopad, Ltd., Barnet By-Pass, Boreham Wood, Herts.

Elcontrol, Ltd.
A new Data Sheet, PR Issue 1, issued by Elcontrol, Ltd, Wilbury Way, Hitchin, Herts, gives details of the company's PR range of photo-relays and associated viewing heads and light sources.

Graton & Knight, Ltd.
The fifth edition of the manual on the GraKnight V-belt drive is now available from Graton & Knight, Ltd., Warwick Road, Boreham Wood, Herts.

Rocol, Ltd.
The above company, of Rocol House, Swillington, Nr. Leeds, have issued a new publication, No. 3D, dealing with their molybdenized lubricants.

Lancashire Dynamo Nevelin, Ltd.
A new leaflet, LS.2700, dealing with their new range of A.C. motor control gear, automatic direct-on-line and star-delta types, has been published by Lancashire Dynamo Nevelin, Ltd., Hurst Green, Oxted, Surrey.

Shell Petroleum Co., Ltd.
A new book, *Compressors and Vacuum Pumps and their Lubrication*, is now available from The Shell Petroleum Co., Ltd., Shell-Mex House, Strand, London, W.C.2. This is not merely a catalogue but is a comprehensive treatise on the subject.

Brook Motors, Ltd.
The above company, of Empress Works, Huddersfield, have issued a new leaflet dealing with Brook starters for A.C. electric motors.

The King's Cross Truck Co., Ltd.
A comprehensive catalogue of trucks, trolleys and similar equipment, containing details of some 1,300 standard items, has been issued by The King's Cross Truck Co., Ltd., of Plant House, Longfield Ave., Ealing, London, W.5.

Renold Chains, Ltd.
Three new publications are available from the above company, of Renold House, Wythenshawe, Manchester. One deals with the adaptability of Renold roller chain drives and another with Renold sprag clutches. A further new leaflet deals with Renold shaft couplings.

Dallow Lambert & Co., Ltd.
This company, of Thurmaston, Leicester, have issued two new publications, Nos. 56 and 59, dealing respectively with their wet deduster series MG, and their dust-collection equipment for foundries.

Northern Aluminium Co., Ltd.
The third edition of their manual on welding aluminium has been published by The Northern Aluminium Co., Ltd., Banbury, Oxfordshire.

SOMMAIRE

(*Suite de la page* 2)

progrès qui ont été faits pendant ces deux dernières années en matière de dessin et de techniques de fonctionnement.

Les articles sur la manutention mécanique publiés dans les revues et journaux techniques et industriels dans le monde entier sont catalogués et abrégés sous cette rubrique.

INHALTSÜBERSICHT

(*Fortsetzung von Seite* 2)

(*Fortsetzung auf Seite* 57)

SUMARIO

(*Viene de la página* 2)

tenido lugar en el curso de los dos últimos años en diseño y técnicas de funcionamiento.

Transportadores y elevadores no fijos. Parte 13 Pág. 32
Por J. M. Beskine, B.Sc.(Eng.)
Los artículos de esta serie tratan de las características de diseño de los numerosos transportadores y elevadores portátiles y móviles producidos por los fabricantes británicos. En este número vienen descritas e ilustradas las máquinas construídas por C. J. R. Fyson & Son.

Carreras en el ramo de la manipulación mecánica. Parte 3: Carretones industriales a motor Pág. 38
Por John R. Sharp
Es éste el tercero de una serie de artículos en los que se discute el campo de acción que se presenta para un joven que ingrese en el sector manufacturero de la industria de los equipos de manipulación mecánica. Ofrece un estudio del rápido incremento en el uso de carretones industriales a motor y esboza las calificaciones y capacitación necesarias para una carrera en este campo específico de la manipulación mecánica.

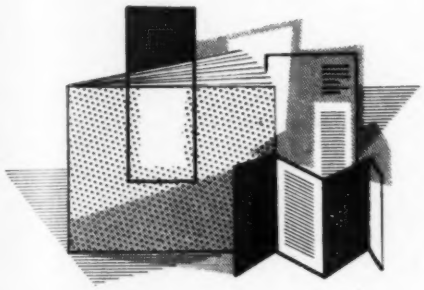
Reseñas de libros Pág. 40

Elementos auxiliares de manipulación mecánica para el personal de Correos Pág. 41
Por un miembro del cuerpo de redactores
Informe sobre una demostración que recientemente llevó a cabo el Departamento de Ingeniería del Post Office ante el personal de los Correos británicos. Vienen descritos equipos de manipulación para aplicaciones generales y también para casos especiales.

Carretones y cargadores para manipulación económica Pág. 44
Por nuestro propio reportero
Informe sobre una exposición de carretones industriales y transportadores portátiles organizada por R. A. Lister & Co., Ltd., en Mánchester.

Adelantos en las correas transportadoras Pág. 47
Por un miembro del cuerpo de redactores
Informe sobre una visita efectuada a la división de correas de la Dunlop Rubber Company Ltd., en el que va incluído un estudio de los más recientes adelantos en las correas transportadoras producidas en los talleres que dicha compañía tiene en Speke, Liverpool.

En esta sección vienen clasificados los artículos sobre manipulación mecánica publicados en las revistas técnicas e industriales de todo el mundo, haciéndose constar un extracto de los mismos.



ABSTRACTS AND REFERENCES

Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.

The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.

LIVE STORAGE OF OUTBOARD-MOTOR COMPONENTS
'On the Go' Handling and 'In the Air' Storage. By Kenneth Rose. *Distribution Age*, Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A. July, 1958. Pp. 34-35. 50c.

Overhead conveyors, gravity racking, rail-mounted trolleys, roller conveyors, and tote bins in diagonal racks, all play their part in the storage and handling of parts, sub-assemblies, and finished products, at the new factory of Evinrude Motors, Milwaukee. Small parts are palletized and transported on gravity rollers. Larger units are carried by monorail in cradles or tote boxes. Sub-assemblies are transferred from store to assembly line by power-driven rail-mounted transfer cars. Parts with a high bulk : weight ratio are stored on trays or baskets suspended from an overhead conveyor moving in the airspace above racks of tote boxes.

At the various stages of assembly, parts are passed from one conveyor line to another, and lifted where necessary to a higher level, without manual manipulation, the entire conveyor system operating under centralized remote control.

ECONOMIC UNIT-LOAD
Warehousing—Report No. 2. By H. D. May and J. K. Nodes. Department of Scientific and Industrial Research, Industrial Operations Unit, 5-11 Regent Street, London, S.W.1.

This report concerns an investigation undertaken for the purpose of evaluating a method for determining the economic unit-load for two commodities chosen at random from the stock held in a grocery warehouse. The evidence obtained was used also to provide data for a possible mathematical treatment of the problem.

Though the procedure followed was prolonged and tedious, it was considered capable of being employed to great advantage in systems where palletization is about to be adopted. It involved the determination of the pallet loads that would give optimum utilization of pallet capacity and of the space available in transport vehicle and warehouse. No one size satisfied all these requirements, and the authors note the desirability of considering the size of the pallet when designing new warehouses or buying vehicles.

COAL HANDLING
Die Neue Förderanlage für den Kohlelagerplatz der Gaskokerei Berlin-Mariendorf. By Erwin W. Schwirz. *Fördern und Heben*, Bahnhofstrasse 61, Wiesbaden, Germany. November, 1958. Pp. 652-656.

A new coal-handling plant, capable of dealing with 9,000 tons/day and feeding the gas works direct from ship, road vehicle or via a stockyard, is described and illustrated. The stockyard has a present capacity of 190,000 tons and an ultimate capacity of 240,000 tons. Seven different combinations of conveyor routes are provided.

The equipment includes the following: a wagon tippler; two cranes for ship discharging; three throw-off carriages; three slewing portal cranes for stockyard work; and belt conveyors totalling 2,170 m in length.

SHIPS DESIGNED FOR BETTER CARGO HANDLING

Moving Towards Automation in Marine Transport. *The Journal of Commerce and Shipping Telegraph*, 17 James Street, Liverpool 2. October 30th, 1958. P.6. 4d.

Capt. V. C. Farrell, inventor of rolling wing decks, is reported as saying that ships now in the design stage will comply with the current trend towards integrated freight and that, in his opinion, U.S. ship designers will combine the best features of roll-on, roll-off and lift-on, lift-off systems, containerization, palletization, and loose and dry-bulk cargo handling.

A design proposal by Capt. Farrell shows a ship with clear decks tunnelled through the superstructure to permit uninterrupted movement of trucks at deck level, thus avoiding the air pollution caused by their operation below decks. Access for the trucks is provided by a two-way ramp mounted on a turntable at the stern. High-speed mechanical handling of containers, palletized cargo, and loose general or bulk cargo, and the accurate positioning of trucks and cargo, are made possible by improved burtoning gear and by co-ordinated counterbalanced rolling wing decks in place of fixed wings inside the decks.

CRANE CABIN ERGONOMICS

Kransteuerkabinen—Hinweis fur Bau und Betrieb. By C. Wiemann. *Förden und Heben*, Bahnhofstrasse 61, Wiesbaden, Germany. November, 1958. Pp. 656-658.

In this article the author discusses the requirements of a crane cabin both from the viewpoint of operator comfort and of ease of construction and maintenance. In regard to the latter it is suggested that prefabrication should be employed wherever possible so that work within the cabin is not necessary when breakdowns do occur. Parts which can be treated in this way include not only standard electrical equipment, but also structural features.

CONVEYING IN MINES

Fördermittel für Streb und Strecke. *Fördern und Heben*, Bahnhofstrasse 61, Wiesbaden, Germany. November, 1958. Pp. 667-682.

New equipment shown at the German Mining Exhibition at Essen, 1958, is reviewed and illustrated in this report. Among the new conveyors on show was one consisting of moulded plates mounted on wheeled bogies and connected together by folded rubber strips. The bogies run on a suitable rail track. Many other types of equipment are reviewed, including scraper, belt, and apron conveyors, vibratory conveyors, loaders, and mine locomotives.

AUTOMATIC CONTROL ENGINEERING

An Introduction to Automatic Control Engineering and Its Influence on our Daily Life. By N. Haglov. *The Anglo Swedish Review*. Swedish Chamber of Commerce for the U.K., 14 Trinity Square, London, E.C.3. December, 1958. Pp. 252-255.

This is a summary of an address given by Mr. N. Haglov at a meeting of the Society of Swedish Engineers in Great Britain. The author discusses in an interesting way the prevalence of feed-back control in nature, and particularly instances the ways in which the human body adjusts itself to varying conditions. He then proceeds to discuss the components of a regulator system, which he classifies as four essential elements. Various means of control for different operations (e.g., temperature control, speed control, position control, etc.) are briefly reviewed.

CONTAINERS FOR BULK MATERIALS

Converting to Bulk Handling. By A. J. Reckenbeil. *Materials Handling*, 2 Bloor Street East, Toronto 5, Ontario, Canada. August, 1958. Pp. 10, 16, 22, 42.

In a talk given to the Toronto chapter of the A.M.H.S., the author draws upon his experience with the National Biscuit Co. of the handling of bulk supplies of flour and sugar. He enumerates and compares various types of container, ranging from bins to bulk rail and lorry containers of up to 100,000 lb capacity. Two types little seen in this country are a three-tier aluminium unit, the parts of which nest together when emptied and reversed, and collapsible rubber bins with capacities ranging from 50 to 370 cu. ft. A variant on the latter is a rubber container for liquids, holding 3,800 gal, which can be rolled into a 25-in bundle when collapsed and is used to enable a standard trailer to carry a liquid cargo in one direction and a dry cargo on the return journey.

SCALE-COLLECTING CONVEYOR

Collector Handles Mill Scale on a Continuous Basis. By J. A. Lowry. *The Iron Age*, Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A. November 20th, 1958. Pp. 106-107. 50c.

A bottleneck caused by the removal of scale formed during continuous milling was eradicated by the installation of a portable collector-conveyor weighing 35 tons in the collecting pit at a steel mill in Ohio. Flume from the scarfer is discharged continuously into the pit, where it is picked up by the perforated buckets of the collector-conveyor, which retain the scale and discharge it on to an existing belt conveyor.

The collector is balanced in such a way that it can be lifted out of the pit for repair or inspection on the hook of a 40-ton overhead travelling crane. While the collector is out of commission the flume builds up, but as it is lowered into the pit the unit swings into the vertical position and its weight is sufficient to take it down through the scale until it rests on the bottom. Having dug itself in it soon clears the accumulation of waste material and continues to operate as before.

WAGON MARSHALLING

Mechanical Marshalling of Railway Wagons in Works Sidings. By G. W. Grossmith. Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1.

An argument in favour of the adoption of automatic wagon-marshalling methods in private sidings is advanced by the author in a paper submitted to the Institution of Mechanical Engineers for written discussion. He advocates techniques whereby all operations are conducted under remote control, without the application of hand brakes to the wagons at any stage.

Among the equipment with which such systems can be effected, he instances mules transmitting a tractive effort of 5 tons or more and automatic pushers exerting a tractive force of 20 tons on the buffers, and also suggests the use of remotely controlled locomotives. Mention is made of wagon tipplers and the various types of automatic brake that are available. Where economical use must be made of space at the sidings, the installation of wagon traversers is recommended.

PALLETIZED CARGO SHIPS

Four Types for the Australian Coastal Trade. By William C. Miller. Institution of Naval Architects, 10 Upper Belgrave Street, London, S.W.1.

First among the four special-purpose types of cargo ship proposed by Mr. Miller in a paper presented to the Australian section of the I.N.A. is a pallet ship of about 500 tons deadweight designed for short runs and river service. As chief naval architect of the Australian Shipbuilding Board, the author envisages a wide scope for such vessels in Australian waters.

There would be accommodation for 282 loaded pallets, each weighing 1·6 tons, approximately. They would be loaded and unloaded by four 3-ton hoists and handled aboard by six fork lift trucks, two operating in the hold and four 'tween decks. Loading and discharge rates would be 60 pallets per hour, and the two operations could proceed simultaneously to give a turn-round time of not more than eight hours.

BULK HANDLING FOR FARMERS

Notes for Guidance on Bulk Handling Equipment. National Association of Corn and Agricultural Merchants, Ltd., Cereal House, Mark Lane, London, E.C.3. 6d.

Recommendations on the choice of equipment available for use by farmers and grain merchants and the designers of farm buildings and vehicles are contained in an illustrated booklet. It has been published with the approval of the Ministry of Agriculture, the National Farmers' Union, and other interested parties, as a result of a meeting called by the National Association of Corn and Agricultural Merchants, Ltd., to discuss the recommendations.

Loading and unloading of bulk grain vehicles, and the mechanical handling and storage facilities available for use on farms, are considered in relation to the minimum loading rates and bin capacities consistent with good economy. Stress is laid upon the importance of standardizing containers, hoses and couplings, and making use of standard vehicles that can be adapted for bulk handling. Farmers are advised to handle their incoming material in bulk up to the last moment, and to transfer their outgoing grain to bulk storage containers high enough to accommodate the largest bulk grain vehicles, or to provide means of elevating it to a sufficient height. Suggestions for promoting speed of loading are directed also to the vehicle designers.

In general, the recommendations are based on developments likely to arise as the trend towards bulk delivery grows.

FLAMEPROOF CONVEYOR BELTING

Assessment of Belt Performance, by J. G. Norvall; **Conveyor-belt Laboratory Tests and their Relation to F.I.G. Trial Results,** by D. Bulgin. The Institution of the Rubber Industry, 4 Kensington Palace Gardens, London, W.8.

Two complementary papers dealing with investigations into the performance of flameproof conveyor belting were

(continued on page 59)

presented at a joint meeting in Liverpool on November 14th, 1958, of the Institution of the Rubber Industry and the Plastics Institute.

In the first of these, Mr. Norvall, of the National Coal Board, described the function of the Board's Field Investigation Group scheme, which had been introduced for the purposes of gathering information on the performance of new types of belting and the selection of belting for general use, and of assisting the manufacturer in his development work. Underground trials had been conducted, and these, though extending over a period of only six months, had provided results and comparisons equivalent to those that would be obtained by testing the material to destruction. A new system had been developed for analysing results, and laboratory tests were being designed. It was hoped that these techniques would make it possible to forecast with reasonable accuracy how a belt would behave in service.

Laboratory tests based on analyses of these results were described by Mr. Bulgin, of the Dunlop Rubber Co. The various sorts of damage to which belts were liable, as revealed by the F.I.G. trials, were simulated by tensile torsional rigidity and impact tests. The results of the laboratory tests had been compared with those of the trials and, although the relationship of the two types of data was a complex one, a useful method of comparison had been found. The evidence so far obtained had indicated that the collection and study of further data would yield a better correlation of the field and laboratory results.

TV AS A LEVEL-CONTROLLER
Here's How Industrial Television Has Improved Handling in Two Industries. *Materials Handling*, 2 Bloor Street East, Toronto 5, Canada. August, 1958. Pp. 30-31.

In the second of the two case-histories outlined in this article two television cameras record the level of wood-chips in a large silo installed at the works of the Dryden Paper Co. One camera is mounted at the top of the bin for viewing the incoming material. The other is at the outlet and is directed toward the point at which the material is discharged on to a conveyor. Thus, by means of a closed-circuit television system, the flow of chips in and out of the silo can be watched and controlled from a central station more than 1,000 ft away.

EGG PACKING
Work Simplification in an Egg-packing Station. By G. A. W. France and V. H. P. Lynham. Department of Scientific and Industrial Research, Industrial Operations Unit, 5-11 Regent Street, London, S.W.1.

In this investigation described in this report, work-study techniques employing flow diagrams, flow process-charts, multiple activity-charts, and activity sampling, were applied to handling methods. It was undertaken at the egg-packing station of the Agricultural Central Co-operative Association for the purpose of demonstrating these techniques. Analysis of the findings revealed that an estimated sum of £2,500 per annum could be saved if the layout of the station were revised to make optimum use of belt and gravity-roller conveyors, and the duties of the personnel were reallocated.

CONVEYORS FOR ROCK SALT
Canadian Rock Salt Team Up Dump Trucks and Conveyor for Flexible Handling. *Materials Handling*, 2 Bloor Street East, Toronto 5, Canada. August, 1958. Pp 24-26.

An underground conveyor is used in conjunction with a dump truck to transport material from cutting face to crusher at the mine of the Canadian Rock Salt Co., Ontario. The conveyor is in three sections, with an aggregate length of 2,000 ft. It travels at a speed of 384 ft/min and carries a load of 50 lb of salt per foot of length. This combination of truck and conveyor is said to have enabled the company to raise the output of the mine to its present level of 4,000-5,000 tons/day.

RECENT PATENTS

TOBACCO MANIPULATOR
Molins Machine Co., Ltd., of Deptford.—U.K. 798550.

Cut tobacco handler showers feed horizontally on to a second conveyor three times as fast, giving 1,000 cigarettes per minute. Patent 682686 is mentioned.

COAL CONVEYOR
Gebruder Eickhoff Maschinenfabrik u Eisengiesser G.m.b.H., of Bochum.—U.K.798554.

Cut coal guided by slide beams with pushers at intervals.

VIBRATORS
J. Ruzicka, of Prague.—U.N.798560.

Oscillating systems for sand, coal or mineral handling are balanced by minimum masses.

HOPPER DISCHARGE
R. J. H. Planiol of Paris.—U.K.798784.

Pulverulents are discharged at low speeds and flow readily by aid of moderate gas fluidization directed at needle valve which rotates.

FEEDER
Societa G. D., of Bologna.—U.K.798791.

Food feeder to wrapping machine which orients non-circular articles (caramels) in cylindrical holes.

SNOW PLOUGH
Council for Scientific & Industrial Research, London.—U.K.798792.

A road snow and ice plough having rolling cutters to break up the surface which is then swept by a blade or loader. Patent 769557 is mentioned.

FISH HANDLING
Arenco Aktiebolag, of Stockholm.—U.K.799218.

Improved fish positioning device for machine dressing, using a helical surface gauge to give high-speed action irrespective of individual fish size.

LABELLER
Morgan Fairest, Ltd., of Sheffield.—U.K.798800.

Bottle labeller has wipers folding labels smoothly from centre round the neck and can allow for overlap.

HIGH-SPEED PACKAGING
American Viscose Corporation, of Pennsylvania. —U.K.799325.

Lettuce, cabbages, etc., are sealed in cellophane, etc., at better than 2 per sec, using a straight-line conveying system, with a bunching element which travels on a conveyor. Reciprocating motions are avoided.

LIFT MAGNETS
James Neill & Co. (Sheffield), Ltd.—U.K.799411.

Permanent magnets, with simple break of lift by moving contact to secondary magnetic circuit.

CRANE CLUTCH
Priestman Brothers, Ltd., Hull.—U.K.799437.

Excavator rope drums having spring bias on clutch to reduce driver concentration needed, yet giving even band wear.

REFUSE VEHICLES
H. Linde, of Sweden.—U.K.799462.

Dustbins are emptied on top of the vehicle and a dust-proof refuse spreader, rake-like in action, is suspended from near the roof on two rails to even out the material.

CONVEYOR DRIVE
Hauhinco Maschinenfabrik G. Hausherr Jochums & Co., of Essen.—U.K.799476.

An intermediate drive for band or plate mine conveyors with means of preventing the chain jumping out of drive.

GRABS
Priestman Brothers, Ltd., of Hull.—U.K.799519.

Clamshell grabs operated by hydraulic control of rotating drum.

GUIDED SKIPS
Preparation Industrielles des Combustibles, of Fontainbleau.—U.K.799523.

Coal mining skips which need no fixed ramps in the head gear for door operation but using small servo-control gear.

LOAD PLATFORMS
Anthony Hoists, Ltd., of Piccadilly.—U.K. 799535.

Fixed or tipping platforms for ballast, etc., lorries are made of heavier metal in the centre section.

SWEEP COLLECTOR
R. E. & C. E. Wilson, of London.—U.K.799536.

Cylindrical bristle stock for mechanical sweeper-collector with a given form of attachment.

PROVENDER TRANSPORT
Mann Egerton & Co., Ltd., of Norwich.—U.K. 799585.

Cubes, pellets, etc., of free flowing grain materials, transported in two or more trailers using a common outlet trough with air line delivery operated by the engine and self-loading device.

VENEER CUTTER
C. H. Muller, of Germany, in U.K.799612.

Improvement on 767728 for shear cutting veneer on conveyor accurately and independent of belt speed. Conveyor temporarily slowed while cut is made.

AEROPLANE HANDLING
Hein, Lehman & Co., A. G., of Dusseldorf.—U.K. 799661.

Carrier (wheeled trolley) for loaded fighters on uneven ground consisting of a T-shaped frame attached to tractor. It can be steered and plane mounts it via ramps.

TIPPER LORRY
Pilot Works, Ltd., of Bolton.—U.K.799677.

For articulated heavy-duty rear bogie, a temporary support member is attached to rear chassis to prevent front end tipping up.

POWER WINCH
T. T. Broughton & Son, Ltd.—U.K.799694.

Winch driven from vehicle motor and with axis parallel power shaft.

ROAD/RAIL CONTAINER
A. J. Kinsey, of Derbyshire.—U.K.799736.

Container mounted on wheels to run off rail wagons on to lorry.

ROLLERS
United States Steel Corporation.—U.K.799749.

Self-centering portion of conveyor for barrels, drums, etc., gravity or power driven with half-width rollers set on slightly bent shafts.

POST CONVEYOR
Staatsbedrijf der Posterijen Telegrafie en Telefonie, the Hague.—U.K.799784.

Improvement on 798944 for bifurcation of channel. The load carriers move in channels with guiding slot at bottom.

AMMUNITION HOIST
Aktiebolaget Bofors, of Sweden.—U.K.800002.

Revolving drum with faster simultaneous feed into compartment from conveyor.

PACKAGING
C. Nicolle, of Paris.—U.K.800073.

Suppository orienter handler and packer using parallel bar feed so that gravity orients goods before packing.

VEHICLE LOADING
Market Transport, Ltd., London.—U.K.800075.

Pivoted cantilever crane mounted on trolleys on both sides of lorry or wagon floors.

DRUM CARRIERS
Metal Containers, Ltd., Pall Mall.—U.K.800094.

Barrel loading platform for lorries and rigid clamp to hold load in position.

TRANSFER MACHINE
Budd Co., Philadelphia.—U.K.800106.

Car body transfer with accurate positioning of stamping in die press, etc., and positive holding at all times.

ELECTRIC WINDER
British Thompson Houston, Ltd., Aldwych.—800111.

A.C. mine winder with a cycle of acceleration, etc. A second motor speeds up changes and is disconnected for creep motion.

RIPPER TEETH
Caterpillar Tractor Co., California.—U.K.800130.

Heavy-duty two-piece teeth for ripping earth, concrete, asphalt, etc. Easily replaceable small cross-section tip held by pin.

PULLEY SETS
Cable Belt, Ltd., Inverness.—U.K.800137.

Modified pulley sets for heavy conveyor use with two or more pulleys per stand.

SLINGS
Eastern Rotorcraft Corporation, Pennsylvania.—U.K.800165.

Nets opening to box form for helicopter and parachute use, collapsible when not in use.

SILO LIFTING
Portasilo, Ltd., of York.—U.K.800272.

A wheeled trolley-mounted lift device for silos, etc., using a ram or screw jack.

CRANE BEARING
Priestman Brothers, Ltd., of Hull.—U.K.800428.

A slew bearing for excavators having pairs of co-axial tapered rollers.

PACKAGE SLING
American Cyanamid Co., New York.—U.K. 800453.

Lifting skid and sling made of very cheap reinforced paper web, usabl[e] w[ith] swinging-fork truck.

MULTI-PLY BELT
Coal Industry Patents, Ltd.—U.K.800540

Reduced stress on outer plies of [co]ttor duck and transfer to inner ones m[ade] of rayon of higher elasticity m[odu]lus. Especially for use in narrow seam[s] w[ith] small drum drives.

BELT
W. J. Jenkins & Co., Retford.—U.K.800[1]16.

Coal, coke, gravel, etc., belt co[n]vey[or] using a heated scraper blade to a[void] clogging.

BIN HANDLER
Midland Industries, Ltd., Wolverhampto[n].—U.K. 800625.

Lazy-tong-like frame mounted on tractor to grab and lift full bins.

LIFT TRUCK
Eccles Birmingham, Ltd.—U.K.800626.

Wheeled hydraulic trolley for h[and]ling long rods, beams, tubes, etc., with hol[e] in the centre front control panel, etc., fit them.

MINE WINCH
Skip Compagnie G.m.b.H., of Essen.—U.K. 800628.

A number of supports move into [a] path from the side to hold it stationary.

STACKER
Kelsey Hayes Co., Detroit.—U.K.800901.

Sheet metal hydraulic blank stacker [for] piles of given numbers.

INGOT CONVEYOR
F. Kochs, of Dusseldorf.—U.K.800948.

A heated chamber for carrying h[ot] steel ingots to mills; rotatable and on wheeled carriage.

OXIDE HANDLING
Newton Chambers, Ltd., Sheffield.—U.K.801[1]

Patents 747964, 748008 are improved [for] removal of spent oxide, by means [of] rotating cutters breaking up an annul[us] of powder and blades moving it to central discharge vent, e.g. to lorries [or] hoppers.

WRAPPING MACHINES
Rose Brothers (Gainsborough), Ltd., of Lincoln —U.K.802743.

Discusses patent 743978 and a [de]veyorized ice cream machine pap[er] wrapper using a series of separate carr[ier] plates.

TRACK PACKER
F. Plasser & J. Theurer, of Vienna.—U.K.802[7]

Discusses patent 794235 and a n[ew] track packer which is independent [of] sleeper width.

SHEET CONVEYOR
Faber & Schleicher A.G., of Offenbach.—U.K. 803027.

Printed sheet conveyor wi[th] pivot[ed] grippers to fit varied paper thickn[ess] without crinkling or deformati[on].

INCLINED FLOOR
M. B. Wild & Co., of Birmingham.—U.K.803[0]

Vehicle and chute floor, r[e]sistant [to] hot coke, with minimal wat[er] seepa[ge] through plates which overlap [and] inte[r]lock.